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THE VETERINARY JOURNAL

A Monthly Review of Veterinary Science.

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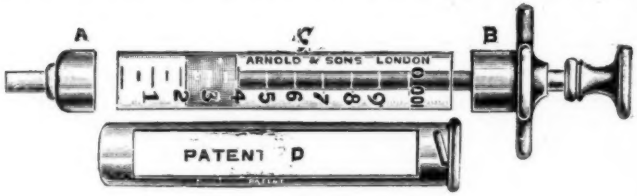

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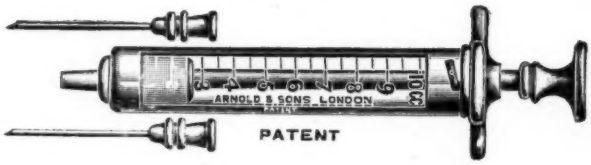

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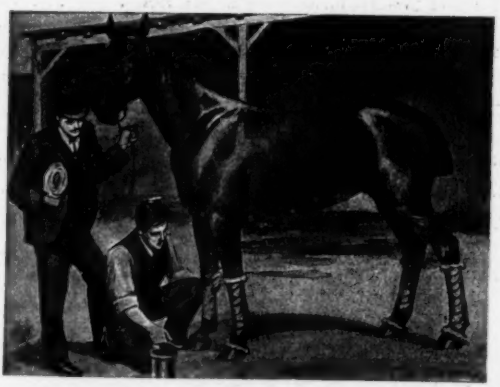

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VETERINARY JOURNAL

AUGUST, 1910.

Editorials.

THE "STABLE MANAGEMENT" PETITION AND THE COMPULSORY PUPILAGE QUESTION.

THE recent petition of the students in regard to a re-arrangement of the present regulations which require all the subjects of any one year to be passed at one and the same time brings again to the front a matter of great importance, at any rate to them.

That such a simple, and yet such an essential and important, subject as stable management should be the chief stumbling-block to any examination is a serious reflection upon the amount of practical knowledge which has been acquired up to that point in the curriculum, and is a very strong argument for the removal of the subject to the first year of study or else for the insistence on compulsory pupilage. It would be a good plan to re-arrange the Class A, B, and C subjects in such a way that "Hygiene and Stable Management" form one subject, and are taught in the first year, for it is very essential that the student shall be acquainted with the habits of animals in health before he can appreciate them in disease. Given a knowledge of animals in health, of hygiene and stable management, the Class A student will be of service to the general practitioner and have no great difficulty in obtaining useful and profitable places during the various vacations.

He will have a fair idea of the dietary and general habits of our various classes of patients in health, a knowledge of which

the average town-bred student of the present day, who goes straight to college from school, is distinctly lacking, and which he has very little chance of acquiring except by coming in contact with animals in some practical capacity. That some such change is necessary is too obvious to need comment. Even the students themselves admit it by their inability to pass the examination test, and it has been for some years the general cry of the practitioner that he could not get pupils of practical use to him, solely because they are apt to expose their ignorance of the ordinary things of daily life when questioned or "summed up" by a keen client.

It is quite time we put our house in order upon this point, and the question of a compulsory pupilage, or some other means whereby a satisfactory knowledge in "stable management" and hygiene will be taught to the student in the early days of his career, will have to be faced very seriously at no distant date.

THE EXAMINATION AND REGISTRATION OF STALLIONS.

OUR readers will peruse with interest the third annual report of the Chief Veterinary Officer for the State of Victoria, Australia, which we publish in this issue. In addition to furnishing details of the examinations conducted during the past year (1909), the report gives a valuable *résumé* of three years' working of the system in vogue in Victoria.

The unsoundnesses scheduled as hereditary are side-bone, ring-bone, bone spavin, bog spavin, and thoroughpin, curb, cataract, and roaring, and possibly few veterinarians will object to any of these being included. The small number rejected for roaring is surprising; the statistics for the years 1907 and 1909 show that of 491 light stallions examined none were returned as roarers, while those of 1908 show that of 295 only two were so certified, the percentage for the three years being only 0·25. Side-bone, as might be expected, is the most serious defect in heavy horses, it being responsible for the rejection of 20 per cent. of the total number of draughts examined, while spavin heads the list in light horses, with a percentage of 3·18 of those submitted. During

the three years the system has been in operation 1,312 draught horses, 787 light horses, and 565 ponies have been examined, the rejections for unsoundness classed as hereditary being 20·07, 9·27, and 3·54 per cent. respectively. The report deals concisely with rejections on account of failure to reach an approved standard, but this aspect does not interest the veterinarian to the same degree.

While Dr. Cameron and his staff are to be congratulated on the result of their labours, and the State is to be commended for the adoption of such an excellent principle as the examination of stallions, we regret fuller particulars are not available. Certain conclusions may, however, be inferred. The system has not the sanction of Statute law; it is only compulsory for horses competing for prizes at shows. A stallion, although denied a certificate, is not debarred from serving mares for fee, and it is not mandatory for the owner to advise clients of his defects; and a stallion once receiving a Government certificate of soundness retains it for life, despite any future pathological developments, however grave. If these deductions are correct, they imply very definite limitations to the good results one would expect to follow from a complete system of State veterinary examination of travelling stallions, and it is to be hoped Dr. Cameron will not rest satisfied until they are removed. Any further developments would, however, almost of necessity imply some method of compensation; otherwise the many breeders would benefit almost entirely at the expense of the few owners of stallions—a position that in some measure must at present exist.

General Articles.

STRANGLES.[1]

By CAPTAIN A. G. TODD.
Army Veterinary Corps.

STRANGLES was one of the first of equine diseases described by the earliest writers in veterinary science. They remarked on its enzootic character, its contagiousness, and its frequency in young animals compared with old. Solleysel described it, in 1664, as a disease which young horses had to pass through in the same way as children had to pass through small-pox. Convinced of its contagious nature, he recommended the isolation of the affected, and pointed out that the most common way for horses to become infected was by drinking out of buckets which had been previously used for affected animals. Lafosse proved by experiments, in 1790, that it was contagious, and Viborg confirmed this in 1802.

In 1873 Rivolta observed chains of cocci in the pus of abscesses, but Schutz [9], in 1888, was the first to publish a detailed description of the organism. Sand, Jensen, Poels, Baruchello and many others have since contributed to the bacteriology of the subject.

The cause of strangles is the *Streptococcus equi*, which is found in large numbers in the nasal discharge and abscesses, which are characteristic of the disease. In unbroken abscesses it is found pure, but in the nasal discharge it is associated with other microbes. The prevailing form of organism is an undulating chain of cocci, each chain being made up of thirty to sixty organisms. The length of the chain varies with the situation: in throat abscesses they are longer than in the nasal discharge, where individual cocci, diplococci and short chains are principally found. This variation in the length of the chains is due to its surroundings. A similar condition may be observed in different culture media, the more liquid they are the longer the chain, and *vice versa*. The method of reproduction is by transverse division.

The organism stains well with all aniline dyes, and retains the stain by the method of Gram.

Biological Characters.

Growth takes place on most media at room temperature. It is both aerobic and anaerobic, and is non-motile.

[1] Read at the meeting of the National Veterinary Association, London.

Bouillon.—In bouillon a white deposit may be seen after twenty-four hours growth resting at the bottom of the tube. When shaken the fluid becomes turbid, but the deposit soon settles, leaving the upper part of the tube clear. The growth, which consists mostly of long chains of streptococci, is more abundant when serum is added to the medium.

Blood Serum.—On the surface of blood serum typical, sticky, transparent, colourless droplets form, which are separate at first, but afterwards confluent. In the water of condensation which collects in the bottom of the tube a sediment forms, which consists of long chains of streptococci.

Agar.—On agar slants colonies appear which are in the form of small, flat, circular, greyish-white spots; these are never confluent and are easily overlooked.

Gelatine.—On gelatine it grows as very small white spots, but the growth is never abundant, owing to the low temperature at which gelatine has to be incubated.

Potato.—There is no visible growth on potato. Sand and Jensen state that it grows into the surface of the potato and cannot be seen, but I have not been able to verify this.

Milk.—It grows in milk, causing curdling in six to eight days.

Glucose.—There is no gas evolution.

Vitality.—A temperature of 60° C. kills it in one hour.

" 80° C. " half an hour.

" 100° C. " a few minutes.

Sunlight destroys it in eight hours, and desiccation in three weeks [1]. It is killed in fifteen minutes by the following: perchloride of mercury, 1—1,500; carbolic acid, 1—200; creolin, 1—80 [2].

Cold does not appear to affect it as much as heat, bouillon cultures frozen for two days are still capable of growing when brought back to a suitable temperature. Although it is easily cultivated in the various laboratory media, its virulence decreases even under the most favourable conditions of artificial cultivation. To bring it back to its original virulence it is necessary to pass it through some susceptible animal.

Pathogenesis.

White mice die in two to four days when inoculated subcutaneously with minute doses of pus or cultures. The infection is general, and the organism can be isolated from the liver, spleen, kidneys, peritoneal cavity, lungs, heart, blood, and lymph glands. There is abscess formation at the seat of inoculation, and if death

is delayed, as is the case when organisms of low virulence are used, abscesses form in adjacent lymphatics, and afterwards in the lungs, liver, kidneys, and other organs.

Rabbits and guinea-pigs are not very susceptible to the streptococcus. Large doses injected into the veins or peritoneal cavity are necessary to kill them. Birds, dogs, swine, sheep and cattle do not contract the disease when inoculated with cultures.

Local inflammation, necrosis, and abscess formation results when horses are inoculated subcutaneously, and this may or may not be accompanied by systemic disturbance. Intravenously small doses cause a thermic reaction lasting twenty-four to thirty-six hours and no general symptoms. Strangles pus rubbed into the skin of healthy horses is said by Joly to produce a typical eruption, but in the few observations I have made on horses of 5 years of age and over, I have not been able to produce any eruption, even when the skin was scarified.

Strangles pus rubbed into the nasal mucous membrane, or coming in contact with any mucous membrane, is often stated to be a sure way of transmitting the disease, but the following observations tend to show that, at any rate in old animals, additional influences are necessary. The nostrils of three horses, aged 6, 11, and 14 respectively, were smeared with both strangles pus and virulent culture (pus in one nostril and culture in the other), and they were kept under observation for one month; the results were negative.

Another horse, aged 14, had 20 c.c. of virulent pus placed at the back of his mouth, and he remained in perfect health for two months afterwards, when he was destroyed for incurable lameness. *Post-mortem* examination revealed nothing abnormal as a result of the observation. Three other horses under orders for destruction, aged 8, 11, and 15 respectively, were given gelatine capsule balls, each containing 10 c.c. pus from a fresh strangles abscess; their temperatures were afterwards taken twice daily, and they were kept under close observation for a fortnight, during which time they were in perfect health. They were then destroyed and a careful *post-mortem* examination made, and not the slightest abnormality could be found.

These observations would undoubtedly be of more value if they had been made on foals, but they are interesting in that they show that aged horses in good health and living under favourable conditions possess an extraordinary high degree of resistance to enormous quantities of virulent infective material. The same pus inoculated subcutaneously into mice caused death in four days.

Schutz, Sand, and Jensen say that the disease is more likely to develop when, before the organism is introduced, the nasal mucous membrane is injured or in a state of catarrh. In one old horse placed at my disposal, a virulent culture rubbed into an abraded schneiderian membrane did not produce the slightest effect. In catarrh, in addition to a large mucous surface being denuded of its protective covering, an animal's vitality is lowered considerably, so that one can understand such animals being more susceptible than others, but I have not had an opportunity of testing the susceptibility in such cases. No matter at what part the streptococcus enters the body, it does not ordinarily extend far from the point of entrance. For this reason the upper air passages and throat are most frequently affected. Its extension is principally along the lines of the lymphatic circulation. It may be carried by the blood stream to distant parts of the body, but this is, fortunately, rare, otherwise malignant strangles would be more common than it now is.

Although it is within the bounds of possibility for the streptococcus alone to cause the disease to develop in susceptible animals, clinical and experimental evidence point to an additional factor being necessary in the majority of cases. Some observers have suggested that the way is paved for the streptococcus by an invisible virus, and others havs stated it requires the aid of other organisms, but no observations of any value have been brought forward to support these views. It is certain, however, that predisposition plays an important part in the development of the disease.

Age is a well-established predisposing cause. It can be safely said that predisposition is inversely proportionate to the age. Viborg and Hertwig [2] observed that 70 per cent. of cases occur in horses under 5 years of age, 20 per cent. over 5 years of age, and 10 per cent. in horses over 15 years or age.

Adverse climatic conditions, long train journeys, domestication, fatigue, standing about at fairs, change of food, change of stabling, recent illness, in fact anything which produces a temporary lowering of vitality increases susceptibility.

An outbreak of the disease is described in Champetier and Payrou's "Étude sur la Gourme" [6] which well illustrates the influence of hardships, cold, and fatigue. During the strikes at Limoges, in France, several brigades of mounted police were sent from distant parts to assist in quelling the disturbance and keeping order. Some of their horses were under 5 years of age, but the majority were over. Nights were cold, work long and severe, and

the feeding very irregular. To protect them as much as possible from the inclemency of the weather, they were picketted in the riding schools of the cavalry regiments of the district. Strangles broke out simultaneously and indiscriminately in old and young; nearly every horse was attacked. During their work they were in frequent contact with the horses of the local cavalry regiments; intercommunication between them was unavoidable, but the disease did not extend to the cavalry. Moreover, when the mounted police left Limoges at the termination of the strikes, there was no time to carry out disinfection of the buildings before they were re-occupied by the cavalry, and although the cavalry horses were of all ages, young as well as old, not one case of strangles was observed.

Vitality in young animals fluctuates much more than it does in old ones, which perhaps accounts for age being such a prominent predisposing cause. Sudden changes of any kind, even though they may be for the better, at first produce a temporary loss of resisting power, which predisposes them to any prevailing disease.

Picquet [3] has seen remounts suffer from strangles after purchase in Hamburg, again after recovery when moved inland to Hanover, and again after they have joined their regiment on the frontier. This, although rare, is a good instance of naturally-acquired immunity failing to protect when sudden changes are made in the animals' surroundings, and should not be forgotten when artifically immunizing horses.

In discussing the vitality of the organism, and its biological characters it was pointed out that it could resist desiccation for three weeks, so that in tracing the origin of an outbreak one has to consider the danger from infected forage, bedding, manure, water troughs, mangers, or any part of the stable contaminated by nasal or abscess discharges. It is quite possible for any of these to be the infecting medium, but if we take into consideration the rapidity with which it loses its virulence, even under the most favourable laboratory conditions, it is not unreasonable to conclude that the danger from any of these sources would depend on the length of time the organism had left the body of an affected animal. This is supported by laboratory observations. It is only with the greatest difficulty that one can get exposed infective material to grow on the most favourite medium. Strains of the organism whose virulence is on the decline can, however, easily be fortified by passing them through susceptible animals.

In remount stables and on board ship the source of the organism

is nearly always an animal in the incubation stage of the disease. At Lusk remount depôt, from April 1, 1906, to March 31, 1907, out of a total of thirty-three cases of strangles, fifteen were so affected on arrival, and in the following year, during the same period, eleven out of forty-three were similarly affected on arrival. But it is not in such outbreaks as these that there is any difficulty in tracing the origin.

Strangles occasionally breaks out in stables which have had no recent arrivals and where there has been no known contact with infected horses. An example of this is where remounts have finished their training, are transferred to the squadron stables, and one or two of them will develop the disease. Although one feels convinced that the source of the infection has not been outside the stable, a careful examination of all the horses will not reveal even a suspicion of a case of strangles. How are such cases to be accounted for?

There are some who maintain that the *Streptococcus equi* is a normal parasite of the upper air passages of equines, and that it only becomes pathogenic under certain conditions. This has not been supported by any scientific observations, and has, therefore, no real value. What appears to be responsible for this hypothesis is that a streptococcus is found in the upper air passages of healthy horses which is indistinguishable from *S. equi*. Future research may demonstrate that there is a difference between them, but it does not alter the fact that the *S. equi* can and does remain in the glands and follicles of the nasal mucous membrane of a certain percentage of recovered horses for a considerable time after recovery. They are harmless to such animals, because of the immunity conferred by the recent attack, and it is highly probable that some of these retain the streptococcus indefinitely and become "carriers" of the disease.

Infection.

There are three ways to be considered by which an animal may become infected: (1) By inhalation, (2) by direct contact, (3) by ingestion.

As the upper air passages are more often affected than any other part of the body it might be thought that inhalation would be one of the principal channels of infection. It would necessitate the organism entering the body in a desiccated state. Recent research has shown that this method of infection in other diseases of the air passages is very uncertain, and as *S. equi* is no exception to the influence of desiccation, one may safely conclude that, although possible, it is unusual for the disease to be transmitted in this way.

Mammary strangles transmitted to the dam by a sucking foal is a good example of transmission by actual contact, as is also genital strangles of the mare transmitted by an infected stallion trying a mare.

There is abundant clinical evidence in favour of ingestion being by far the most common method of infection, and the irregular way in which the cases occur in an outbreak point to the watering-trough as being the intermediate channel of infection. In the best civil stables, and in those remount depôts where every horse has his own bucket, it is hardly ever seen. A striking example of this is the remount depôt at Melton Mowbray, where, out of 263 horses which joined from April 1, 1908, to March 31, 1909, only two developed the disease. One of these developed it within eight days of joining, the probability being that it had it in the incubative stage on arrival. From April 1, 1909, to March 31, 1910, out of 225 horses which joined there was not even one case of strangles. Although many of these horses were six years old or over, one-third of the number were four or five years of age. Most horses when drinking bury the mouth and nostrils in the water, so that small particles of nasal discharge which escape ordinary observation are easily deposited in the water. In examining water-troughs at which horses in apparent health have watered, flakes of mucus may be found which on microscopical examination will reveal streptococci and other organisms, and although I have not yet been able to establish the identity of all of them, there is no doubt about the presence of *S. equi*. When large numbers of young horses are collected together, as in fairs, dealers' stables and railway trucks, it is impossible to know how recently some of them may have recovered from the disease, and watering as they do out of the same buckets or troughs, it is an easy matter for infection to be spread amongst them.

The simple form of the disease, viz., that associated with nasal discharge, sore throat, and submaxillary or parotid abscess, is that which is most commonly seen in England. The malignant form is seen mostly where hygienic conditions are bad, and in establishments where large numbers of young horses are kept together. We are more fortunate than our military colleagues on the Continent in this respect, in having a much milder form of the disease to deal with. Continental horse management is different to ours, and may, in some degree, contribute to this.

In a Continental Army with which I am familiar the remounts are bought at three and four years af age, and remain at the depôts until they are five years of age, when they are issued to regiments. This

necessitates the keeping of some 300 or 350 horses together for about a year. It affords unique opportunities for making observations on the course of an outbreak, reference to which is both interesting and instructive, especially if at some future time we adopt a similar system in England.

In the army to which I refer remounts are bought at fairs or at previously arranged centres in breeding districts; purchasing begins in October and goes on till June. After purchase they are sent by train to the depôts, where they are turned out to graze. The first part of the procedure entails irregular watering and feeding, possibly a railway journey to the fair and another to the remount depôt, and a good deal of standing about, all of which predispose to the disease. The result is, that some arrive at the depôts clinically affected, and many of the others develop the disease shortly after arrival.

The largest numbers are bought during December, January, and February, so that batches are continually arriving. Atmospheric variations at this time are frequent, and the horses feel the effects of these journeys and changes more than at other times. Grazing is scarce, which necessitates feeding the horses in sheds, where they huddle together for protection against wind and rain. Cases now become numerous, and it is at this time that malignant forms of the disease are mostly seen. With the improvement of the weather and the increase in the grazing, the horses leave the sheds for the open fields, with the result that there is an enormous drop in the percentage of sick, and by the beginning of summer the outbreak is practically over. This is the usual evolution of the disease at the Continental remount depôt I have in my mind, but there are occasional years, more especially when the winter has been a very mild one, when the disease is at its height as late as May or June.

The above system is conducive to most horses passing through the disease before their issue to regiments, but whether it is an advantage or not is doubtful. The high percentage of malignant cases, the mortality, and the number which are left unsound in the wind after the disease, are not in its favour.

The mortality varies from 0 to 3 per cent. When hygienic conditions are bad it is high. The deaths are mostly from malignant strangles, and more amongst young than old. On the Hungarian State Stud Farms, from 1886 to 1889, 1,711 foals, almost exclusively under 1 year, were attacked, of which forty-eight died, or 2·8 per cent. At the same time the disease was prevalent in the State Stallion depôt, and out of 118 stallions attacked there was only one case of malignant strangles which was destroyed.

In the Prussian cavalry the mortality varies in different years from 0 to 3·4 per cent. From 1900 to 1903, out of 3,954 remounts affected, eighty-two, or 2·1 per cent., died. In the Prussian remount depôt, from 1899 to 1906, out of 1,328 horses attacked, thirty-five, or 2·6 per cent., died.

In the French Army, from 1888 to 1897, out of 90,381 horses attacked, 992, or 1·1 per cent., died. From 1900 to 1901, out of an establishment of 100,000 horses, there were 18,165 cases and 283 (1·5 per cent.) deaths.

In the English Army over a period of years the average death-rate was 0·76 per cent.

Symptoms: Incidence.

The symptoms of strangles are so well known that there is no need to describe them here. There are one or two points, however, to which I propose to refer, as they will have to be considered in dealing with the prevention of the disease. There are two forms of the disease recognized in England—viz., simple and malignant strangles. To these should be added atypical strangles; it would include these forms of catarrh, sore throat, and catarrhal fever which are caused by the *Streptococcus equi*. Until recent years these diseases have been looked upon as being quite distinct from strangles; but, although laboratory methods and clinical observations have as yet failed to provide a distinguishing difference between the typical and atypical forms, there is abundant evidence to prove that the latter are often the beginning of the disease. Percivall [5] observed this, and in a paper read before the Central Veterinary Society last year, W. R. Davis [7] gave one or two good instances of catarrhal affections in old horses being the origin of the typical forms of the disease in young ones. Horses over 6 years of age and those having secondary attacks of the disease usually have it in the atypical form. It is best to consider any form of catarrh in a remount stable as specific, and more especially when some of the others have the disease in the ordinary form.

Out ot 930 remounts passing through Lusk remount depôt from 1906 to 1909, 82 (0·88 per cent.) had typical strangles, and 39 (0·41 per cent.) had symptoms of catarrh only; although the latter had to be entered on the sick returns as catarrh it is extremely probable that some of them were mild cases of strangles. It may be said with almost positive certainty that long-continued catarrh in young horses, especially the form known as catarrhal fever, is suppressed strangles; suppressed in the sense that there is no external abscess, but the

pharynx of such a case has abscesses in it which are the source of the discharge.

A natural attack of the disease confers a varying amount of immunity, the duration of which is difficult to ascertain. Humbert [2] records a four years' experience amongst horses over two years of age in which 2,195 had it once, 543 twice, and 121 three times, and 1,641 remained unaffected. It is not stated whether atypical forms of the disease are included, and as secondary attacks sometimes assume these forms, these figures may give an erroneous idea of the recurrence of the disease.

Preventive Measures.

Owing to the facility with which horses recover from strangles, and the slow and uncertain manner in which it spreads in the ordinary way, preventive measures are rarely adopted. The breeder does not look upon it seriously because very few die from it, and most animals on farms recover with no after effects. The sufferers are these who keep large numbers of young horses together, at the time when they are first put into work. Here the loss is more from depreciation of value from unsoundness in the wind following on the disease than from actual mortality. Serious as this loss is it is nearly always accepted as inevitable.

In making an organized effort to keep away the disease and to prevent its spread to others, the following measures should be adopted: All new arrivals should be quarantined for a fortnight before being allowed to join the other horses. The period of incubation being from three to eight days this would allow ample time for the disease to develop if they had it in the latent form.

Where only a few horses are kept this is a simple matter, but where horses arrive in fairly large numbers, as they do when joining regiments, it is not so easy, and special precautions have to be taken. The stables for their reception should be so constructed as to make it impossible for one horse to dip his nose into the manger of his neighbour or touch any of his neighbour's food. This can be effected by having a stall partition, or by the ring and sliding bar method of tying up, the collar chain never being more than 2 ft. 9 in. in length.

The bedding of all horses should, after the soiled parts are removed, be allowed to remain in the stalls, especially for the first fortnight. The system of taking it out of the stalls and allowing it to mix with the general supply of the stable is apt to spread other diseases as well as strangles. With strangles the danger is more from

eating infected bedding than from skin contact with it. For this reason peat moss would be preferable to straw.

As the bucket system of watering in regiments is out of the question on the score of expense, and the risk there would be of buckets getting mixed, a common watering-trough can be used, provided it is emptied and washed out after every watering parade; this would ensure that no unobservable discharge was left in the water.

Before each watering parade there should be a nose and throat inspection by the non-commissioned officer in charge, and an officer's inspection at least once a day. Ang horse with the slightest suspicion of nasal discharge should be prevented from watering at the common drinking trough, and reported to the veterinary officer in charge. Major F. Eassie, D.S.O., A.V.C., has devised a system, which is now adopted at Lusk remount depôt, by which all remounts out at grass go through a "crush" once daily without the trouble of being caught up. They receive a feed of corn once in the day, previous to which a bell is rung. This is the signal for them to come from all parts of the field and walk through the "crush" into a feeding paddock. A well-trained Non-Commissioned Officer stands at the end of the "crush," and secures and isolates any horse with nasal discharge. By making this daily inspection strangles has been kept well under control at Lusk.

Particular attention should be paid to the ventilation of the stable. Young horses cannot have too much fresh air. In addition to modifying most of the diseases they suffer from, it often keeps them robust enough to escape infection.

When cases have been diagnosed the stall should be evacuated and thoroughly disinfected, particular attention being paid to those parts which have been soiled by nasal or abscess discharge.

The bedding should be burnt, as well as any food which may have been left in the manger. In remount stables the disinfection of the whole stable is unnecessary in isolated cases, but when the disease has spread through most of the occupants it should be thoroughly disinfected before re-occupation. This can be thoroughly and effectually done by using a blow lamp on the walls, floors, and mangers, and afterwards applying a suitable disinfectant with a spray pump.

Immunization.

Artificial attempts at producing immunity have been many and varied. The Russian method is the oldest and at the same time the crudest. It consists in turning the animals into a deep pool for half an

hour, exposing them to cold winds. and giving them very cold water to drink. This gives the organism every chance of gaining access to the system, and the result is that the animals are got through the disease in the mild autumn weather and sufficient immunity is conferred to carry them through the very severe Russian winter, during which mortality is very high in the unprotected.

Jensen and Sand injected cultures intravenously, and found that, although they conferred protection against artificial nasal infection, they were dangerous on account of the phlebitis and local inflammation which they frequently set up.

Kitt, in 1906, injected two foals with 5 to 10 c.c. of killed serum bouillon culture and found that they afterwards resisted nasal and bowel infection.

Gabritchewski injected simultaneously concentrated bouillion cultures evaporated down to one-tenth their volume and sterilized with 0·5 per cent. carbolic acid. Six foals were inoculated and they afterwards withstood virulent cultures being rubbed into the nasal mucous membrane. They also showed higher resistance than the controls to 1·5 to 2 c.c. of virulent culture subcutaneously.

Baldrey [10] working on the lines laid down by Wright, vaccinated rabbits and found that they afterwards resisted subcutaneous inoculation of virulent cultures.

No practical method of immunization suitable for preventing the disease in large studs has yet been devised from either living or dead organisms. More encouraging results have been obtained from the serum of recovered or hyper-immunized horses.

Delvos used the serum of recovered horses for protection in 20 c.c. doses subcutaneously, and found that ninety-four horses so inoculated did not contract the disease and that sick animals receiving 30 to 40 c.c. repeatedly recovered in a very short time.

Rohrs found that with serum injection in the treatment of the disease there was less nasal discharge, not so much fever, and resorption of abscesses on the point of development. He employed it in 10 c.c. doses three times a day on the first, second, and third days.

Jacoulet noticed that fever was of shorter duration, complications and relapses less frequent, and that the patient got better sooner when treated with serum. A daily dose of 20 to 30 c.c. was given; 80 to 100 c.c. brought the disease to a standstill.

Dassonville and Wissocq [8] have shown that by injecting horses with progressively increasing doses of strangles streptococci a protective serum can be produced, which confers a passive immunity lasting

from four to six weeks. Their method of hyper-immunization consists of giving 2 c.c. doses of cultures subcutaneously and gradually working up to 100 c.c. doses intravenously. Twenty-five or more injections are necessary before the maximum dose can be given. They tried to convert the passive immunity into a permanent one by injecting cultures of the organism about the same time as the serum, but had to abandon the method on account of the severity of the local lesions. The French Army tried the Dassonville serum but did not adopt it for general use. Civil Veterinary Surgeons in and about Paris appear to have had remarkably good results from the serum.

Desoubry [12] at a recent meeting of the Société Centrale de Médecine Vétérinaire, records having successfully inoculated 650 animals between April 1, 1907, and May 31, 1909, at places where the disease ordinarily occurred; M. Desoubry's practice is mostly amongst thoroughbreds, and his plan is to give a 20 c.c. dose to all foals (*a*) at birth or shortly after, (*b*) at the time of weaning, (*c*) when they are sent to their training establishments, (*d*) when an outbreak occurs in a stud, to immunize those exposed to infection.

Poels, of Rotterdam, produces a serum by hyper-immunizing horses with weekly injections of virulent cultures, beginning with 1 c.c. and increasing the dose gradually up to 20 c.c. After a total of 100 c.c. has been injected the serum is rich enough in protective substances to be used in immunizing horses. The dose of the serum is 10 c.c.

Jess, Piorkowski, Hoecht and Gantz, in Germany, have also produced protective sera which have found favour with some and not with others.

The reason why serum inoculation against the disease has not been generally adopted is partly because of the high price of the serum and partly because of the immunity produced is not a permanent one. There are occasions, however, when a temporary immunity can be utilised to great advantage, and although it has not as yet found much favour in England it has been put to good practical use in other countries.

The duration of the immunity conferred by serum is not exactly known. With most other diseases it begins to decline after the tenth day and has disappeared by the end of the third week. It has been pointed out by Bassett [13] that in the case of a homologous serum, viz., that used on an animal of the same species as that from which it has been prepared, the immunity is twice as long as that conferred by a heterologous serum, viz., that prepared from an animal of a different species. In the first case it is said to be three or four weeks and in the second about twelve days.

The size of the dose also, has, no doubt, some relation to the duration of the immunity. In France a larger initial dose is injected in preference to repeated small doses. Their reason for doing so is, that recent researches have shown that when anti-bodies, which are the protective agents in anti-sera, are injected into animals, they provoke the formation of corresponding anti-bodies. Secondary doses are neutralized more quickly than the first, so that there is a smaller production of anti-bodies and a corresponding shorter period of immunity conferred.

For most practical purposes in the Army one initial dose of 20 c.c. would perhaps be better than repeated small doses, but this is a point which only practical experience can decide.

In the service the time that remounts most require protection is (1) when they are bought; (2) on transfer from a remount depôt to a unit; (3) on transfer from the remount stable to a squadron stable. On all these occasions there is a lowering of vitality and a temporary breakdown of an animal's resistive power, which, providing the streptococcus is about, is conducive to the development of the disease.

I regret that I am not in a position to give exact statistics on the preventive value of serum in the English Army, but I am sure I am safe in saying that the immunity conferred may be compared with that acquired by an attack of the disease. It may not be quite so marked, but it is better in that the disease often leave after-effects, in addition to immunity, which seriously depreciate an animal's value. Secondary attacks in unprotected horses are mostly in the atypical form of the disease, and it has been observed that when serumized horses do get the disease, it is usually in this or a correspondingly mild form. Further, the dreaded after-effects are seldom seen in serumized horses. Of sixty-nine protected remounts in the Aldershot command only one was found to be unsound in the wind when examined after convalescence. This one had never shown any symptoms of strangles or catarrh, so it is reasonable to conclude that it was due to some other cause. Compared with the above, nine out of eighteen unprotected remounts were in various stages of wind unsoundness. This is a very high percentage, as ordinarily only 20 to 25 per cent. are left unsound in the wind, but even this is far too high, and anything which reduces it warrants its use till something is discovered which will give permanent and absolute protection against the disease.

We have not had the excellent curative results which some of our

continental *confrères* have experienced, but in many cases treated, serum seemed to modify the attack and the progress of the disease; animals became brighter, the character of the nasal and abscess discharge changed, and in some instances throat swellings, which in ordinary cases we would expect to develop into abscesses, gradually subsided without abscess formation.

It does not follow that because horses have been inoculated against the disease, disinfection and other hygienic rules should not be observed. It is only by using a combination of both that any real benefit will result.

Palliative Treatment.

Strangles being a specific disease and running a definite course, treatment is essentially palliative. Too much stress cannot be laid on a good supply of pure air. It is well known that animals turned out to grass seldom get the disease in a severe form, and usually recover without complications or after-effects, whereas the reverse is the case when animals are kept in large numbers indoors. In the Service the animal is usually put in a box in the hospital, but sometimes, owing to the large number affected, they have to be kept in stalls. Personally I would prefer to see them picketed in the open at any time of the year, if boxes were not available. Recovery would be much quicker, and complications and after-effects much more rare if this were adopted.

Food should be of the laxative type, and easily digestive. There is nothing better than an abundance of green food when it is in season, which, in addition to being laxative, cooling, and easily digested, assists in eliminating the toxins from the system by reason of its laxative and diuretic properties. All food should for preference be given off the ground to allow nasal discharge to drain freely away, and it is better to put it in small quantities round the box than in one place, so as to avoid it being contaminated by the discharge. When the throat is very sore, the food sometimes collects and ferments in the back part of the mouth and pharynx through the horse being afraid to swallow. In all cases when dysphagia is pronounced it is better, for this reason, to withhold all solid food, and to rely on gruel, milk, linseed tea, and even water till the symptoms are relieved.

Water is best given in separate buckets, and frequently changed, as it soon gets filthy from the nasal discharge. When the throat is very sore it should have the chill taken off to prevent paroxyms of coughing coming on. For all ordinary purposes, however, cold water is best.

Steaming gives relief when there are internal throat abscesses and when there is excessive nasal discharge, Washing the nostrils and smearing them with vaseline facilitates the flow of the discharge, and prevents it from collecting around the nostrils. Details such as these would come under the heading of good nursing, and are very essential in all severe forms of the disease.

Medicinally very little is required. Salts of potash in the drinking water and electuaries to relieve soreness of the throat are the most frequent remedies used. Clive Webb [11], found citric acid in one drachm doses dissolved in water, three times daily for three days, of the greatest value in relieving dyspnœa, and attributes its success to its action on the coagulability of the blood. It encourages the transudation of lymph and thereby aids bacterial defence; at the same time toxins are more readily carried away by reason of the increased circulation in the diseased parts.

Local treatment has for its object the ripening of abscesses and the evacuation of pus. There are several ways of attaining this, blisters and liniments of various kinds, poultices, fomenting, &c., but the best method in my hands has been the application of dry heat. This is obtained by packing the throat with dry tow or wool and retaining it there with a special hood. It has the advantage of being labour-saving—a great consideration when treating large numbers of animals—continuous in action and therefore quicker than any other method. All that is required is daily adjustment of the packing material, which can be done at the time of the daily inspection. When the abscess bursts, which it does after two or three days, the tow is replaced daily after cleansing the parts till the wound heals. Local surgical interference is seldom necessary.

In all cases of strangles there is a varying amount of prostration, and in some a loss of condition, from which recovery, particularly in young animals, is slow. In acute cases the period of convalescence is exceptionally long. To appreciate this fully one should ride the same horse before and after the disease, and note the want of vitality in the movements and the rapidity with which they tire, long after all outward symptoms have disappeared. There never should be any hurry about returning horses to duty after recovery, for in addition to the danger of their being carriers of the disease, there is serious risk of joint disease supervening on even the most ordinary work, and if there are any suspicions of the wind being affected it is a sure way of firmly establishing it. An ideal way of dealing with horses after recovery is to give them a run at grass, but this is not always

possible, so one has to make the best of things by advising suitable food, the lightest of exercise and strict attention to hygiene.

Vaccine Therapy.

Encouraged by the hopeful results of vaccine therapy in abortion of cattle, I have made a vaccine on similar lines, and used it with most encouraging results in the treatment of the disease. After isolating and fortifying streptococci from strangles pus, by passing them through white mice and growing them on inspissated blood serum at 37° C. for twenty-four hours, large flasks (500 c.c.) of 10 per cent. serum bouillon are inoculated and incubated for one month. Six per cent. sterilized glycerine is now added, after which it is exposed in an incubator at 60° C. for two days over unslaked lime. This kills the organism and causes evaporation of the culture down to a thick paste, which is dissolved in half per cent. carbolic acid and sterilized distilled water, and brought up to half its original bulk, which makes it thin enough to pass through an ordinary hypodermic needle. It is now run into 5 c.c. sterile tubes, hermetically sealed and stored ready for use. This material which I have called *Strangline*, was injected subcutaneously into healthy animals in doses varying from 1 to 10 c.c.

The horses receiving the maximum dose had a large local reaction lasting four to five days, and a thermal reaction lasting two days, so it was decided to use it in 5 c.c. to 10 c.c. doses in the treatment of the disease.

The following are a few examples of the cases treated :

Case 1 (*Captain H. E. Gibbs' Case*).—Catarrhal fever (atypical strangles). Admitted March 4, 1910, with bilateral nasal discharge, impaired appetite, and a temperature which varied from 103° to 104°, up to March 7.

March 7,—Strangline 10 c.c. injected.

March 9.—Animal feeding better, and brighter. Nasal discharge visibly decreased.

March 10.—Strangline 10 c.c. injected.

March 11.—Nasal discharge of a watery nature.

March 17.—Animal completely recovered.

Case 2 (*Captain H. E. Gibbs' Case*).—Chronic catarrh. Has been coughing and discharging from nostril since February 5. Various remedies have been tried with negative results.

March 20.—Strangline 5 c.c. injected.

March 23.—Discharge from nostrils and cough almost disappeared.

March 30.—No cough or discharge from nostrils. Discharged cured.

CASE 3 (*Captain H. E. Gibbs' Case*).—Strangles. Admitted February 20, 1910, with bilateral abscesses and nasal discharge, and a temperature varying from 103° to 104°. Abscess ready to burst on March 7.

March 7.—Strangline 10 c.c. injected.

March 9.—Right submaxillary abscess burst. Nasal discharge visibly less. Temperature 101°.

March 10.—Left abscess burst. Nasal discharge ceased. Ten c.c. strangline injected.

March 15.—Abscess wounds nearly healed.

March 18—Another abscess forming left submaxillary region. Animal off feed. Nasal discharge recommenced. Strangline 10 c.c. injected.

March 22.—Nasal discharge much diminished and watery in character.

March 24.—Abscess burst.

March 26.—No nasal discharge.

April 2.—Abscess healed.

April 3.—Discharged cured.

CASE 4 (*Captain H. E. Gibbs' Case*).—Irregular strangles. Admitted January 14, 1910. A severe case. Made no progress at all under ordinary treatment, and on February 10 the horse had sixteen abscesses discharging pus in the region of the throat, face and chest. He was feeding very indifferently and was much emaciated and very weak, so much so that it was decided to apply for a board to consider the advisability of destruction.

February 11.—Strangline 10 c.c. injected. Result: Discharge visibly diminished, animal brighter, and feeding better.

February 16.—Strangline 10 c.c. injected.

February 24.—Strangline 10 c.c. injected. Nasal discharge stopped, and all abscesses healed, except three small ones. Appetite excellent. Horse much brighter.

March 1.—Strangline 10 c.c. injected. All abscesses healed.

March 7.—Strangline 10 c.c. injected.

March 14.—Small abscess in temporo-maxillary region forms and burst on 15th.

March 18.—Abscess completely healed. Horse cured.

CASE 5.—Irregular strangles. This horse was used for serum production, and developed an abscess in the jugular grove on December 9, 1909. This was opened on December 11. It never completely healed, and a second one developed on January 1, 1910. After it was opened all kinds of remedies were tried, but the abscess continued to discharge.

January 30.—Strangline 1 c.c. injected. No appreciable effect.

February 5.—Strangline 5 c.c. injected.

February 9.—Abscess healed and gave no further trouble. Discharged cured.

Case 6 (*Captain A. J. Williams' Case*).—Irregular strangles, with temperature 105·2° F., submaxillary swelling, nasal discharge and sore throat. From February 11 to 16 the swelling extended to the temporo-maxillary articulation and to the face. Abscess opened on right side of the 16th, submaxillary abscess on 17th, temporo-maxillary and five small abscesses on 19th. At this time there were nineteen abscesses on various parts of the face and throat.

February 23.—Strangline 5 c.c.

February 25.—Abscesses much healthier and discharge less.

February 26.—Two fresh abscesses in right sub-parotid region, opened on 27th.

February 27.—Abscesses healing rapidly, very little discharge from them. Large sub-parotid abscess opened.

March 1.—Abscess above right eye opened. Strangline 5 cc. injected.

March 14.—All abscesses except two healed. A deep-seated abscess above right eye noticed. Strangline 5 cc. injected.

March 15.—Eye abscess burst.

March 22.—Symptoms of pneumonia.

March 26.—With exception of slight serous discharge from above right eye, all abscesses healed.

March 31.—Symptoms of hydrothorax noticed. Animal got gradually weaker, and died on April 5.

Post-mortem examination revealed extensive pleurisy and pneumonia, and a large mediastinal abscess containing one quart of pus.

Case 7.—Irregular strangles. This horse was being hyper-immunized for serum production, and developed irregular strangles on December 6, 1909. Abscesses formed in the jugular furrow, the left parotid region, the near shoulder, the withers, the near buttock and the off stifle, and these either burst or were opened and the pus evacuated. The horse lost a lot of condition and became so weak that he was unable to stand and had to be put in slings.

January 31.—Strangline 10 c.c. injected.

February 4.—Jugular, wither, and thigh abscesses healed.

„ 5.—Strangline 10 c.c. injected.

„ 8.—Stifle and parotid abscesses healed.

February 14.—10 c.c. Strangline injected.
" 18.—20 " " "
" 24.—10 " " "
" 28.—10 " " "
March 4.—20 " " "
" 8.— 8 " " "
" 14.—10 " " "

The shoulder abscess continued to discharge to the end, although the quantity then was infinitesimal.

" 23.—As the horse was still unable to stand, he was destroyed on the recommendation of a board of Veterinary Officers.

Autopsy.—Extreme emaciation, a small deep-seated abscess with tissue necrosis on the near shoulder, a large deep-seated abscess in the near hind quarter, containing two quarts of fœtid inspissated pus. The left parotid gland was enlarged and indurated as the result of an abscess. Other organs healthy.

Strangline may be injected into the side of the neck or into the loose connective tissue in the pectoral region. I prefer the neck, as the local reaction can be seen better here. This varies in size from a pigeon's egg to one resembling positive mallein reaction in glanders. It disappears in the course of three or four days, and seldom gives any trouble. I am unable to say why it varies as it does.

Strangline has no appreciable effect on the temperature, which depends more on abscess formation than anything else in this disease.

Cases 4, 5, 6, and 7, are evidence of its value in the treatment of malignant forms of the disease. The life of Case 4 was undoubtedly saved by its use, whilst the others show that it exerts a healing influence on strangles abscesses far superior to any recognized form of treatment. On the other hand, Cases 6 and 7 indicate that it has no effect on the prevention of abscess formation or on their resorption.

The quantity and quality of the nasal discharge was altered in Cases 1, 2, and 3. This points to its value in the treatment of the atypical forms of the disease (so-called cases of catarrhal fever and sore throat) and protracted recoveries characterized by persistent nasal discharge, cough and general unthriftiness. As nasal discharge is one of the principal vehicles of the contagion, any remedy which reduces the quantity or gets rid of it quickly will materially help in preventing the spread of the disease. There is a further effect it is not unreasonable to hope for, viz., that horses so treated will not harbour the streptococcus in the nasal mucous membrane after recovery, and be a source of danger to others. Its action on the nasal discharge indicates that it might have a bactericidal action on the organism in this

situation, but only an extensive use of the vaccine and careful observation will settle this.

The above results were obtained from the first lot of vaccine made, and as they were so promising a much larger quantity was made the second time. Unfortunately, I had no shallow trays large enough for evaporating such a quantity down quickly, and instead of this process taking two or three days, it took over a week. This vaccine gave anything but good results, and had to be destroyed.

There is still much to be learned regarding the size and frequency of the dose, and it may be there are stages in the disease when it is not advisable to use a vaccine. Careful clinical observation will decide these points.

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CONTAGIOUS GRANULAR VAGINITIS IN CATTLE, AND ITS RELATION TO STERILITY AND ABORTION.[1]

BY AINSWORTH WILSON, F.R.C.V.S.

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THIS disease, peculiar to the ox, is essentially a catarrhal inflammation affecting the vulvo-vaginal mucous membrane in females, and the prepuce and glans penis in males.

The pathognomonic symptom is the presence of small nodes or granules; these are found in heifers and cows during the whole course of the disease; they have also been observed occasionally in bulls, while vesicular and ulcerous lesions are entirely absent.

[1] Read before the National Veterinary Association, London, July 27, 1910.

The causal agent is said to be a streptococcus, discovered by Ostertag, found in the deeper layers of the vaginal mucosa, and in the muco-purulent discharge. The irritation excited by the specific streptococcus is followed by swelling of the lymph follicles; these appear prominent on the surface of the mucous membrane in the form of numerous small, firm granules. The catarrh may remain localized in the vestibule and vagina; on the other hand, it may extend forward to the uterus. Untoward sequelæ are endometritis, pyometra, cystic degeneration of one or both ovaries, and hypertrophied corpora lutea. Abortion and sterility are therefore said to be frequently associated with virulent outbreaks of the disease.

In these days of the ubiquitous motor-car, the dairying industry invites the earnest attention of the veterinary profession. It is to our advantage to conserve the reproductive powers of the more valuable dairy and breeding animals, thereby continuing their usefulness as stock getters and milk producers.

Any disorder of the genital apparatus may result in serious economic loss, due to the diminished and irregular supply of milk, and the compulsory fattening of valuable deep-milking cows for the butcher. Acute vaginal catarrh is at present disseminated over wide areas in two continents, and the damage attributed to it is said to be greater than that caused by foot-and-mouth disease. Many European writers regard it as one of the worst scourges affecting dairy cattle. I therefore offer no apology for bringing the disease under the notice of members of The National Veterinary Association.

My attention was first drawn to the malady about a year ago, and since then I have had it under observation from a clinical standpoint. It has happened that a considerable number of dairy stock of all ages have passed through my hands while engaged in testing with tuberculin, and in the ordinary routine of practice. About 1,800 head of cattle have been available for examination, most of them periodically, and a record has been kept in various herds in regard to (1) age, (2) nature of the lesions, (3) sterility and abortion, (4) genital soundness.

Sixty per cent. of the females were affected with chronic vaginitis follicularis in varying degree; most of the animals were bred in Essex, while others were brought from different counties to be tested. Not a single case of the acute disease, as described by European writers, has presented itself.

The chronic form is admittedly a comparatively mild and insignifi-

cant affection, which, so far as my observations go, bears no distinct relation to sterility co-existing in the same animal. I fear, therefore, that little value can be attached to the data I have collected, unless they serve to draw more attention to sterility in general.

Synonyms.—Infectious vaginal catarrh, vaginitis verrucosa, chronic vaginitis follicularis, vaginitis et metritis follicularis infectiosa (Hess), granular venereal disease (Williams). Moussu [7] calls the vesicular venereal disease "Contagious vaginitis." To avoid confusion in nomenclature, it would be well to restrict the term "contagious" to the disease under consideration.

History.—Contagious granular vaginitis appears to have been first observed in Switzerland many years ago. In 1903, the Swiss Veterinary Surgeons' Society instituted a thorough investigation, and later on, under the able direction of Professor Hess, a report was published replete with valuable information and statistics relating to the extent and the ravages of the plague.

It is widely disseminated throughout various parts of Germany, and in other European countries it has attracted considerable attention for some years past. Williams [5] considers that the malady has probably existed in the United States for a quarter of a century, although it was apparently only recognized as a distinct disease two years ago. There are reports as to existence in Canada, and indeed it would appear to be widely distributed over the North American continent.

In this country the disease has received little or no attention, and no observations, so far as I am aware, have been recorded in our literature. This may be due to the fact that the acute vaginal and uterine inflammation is a rare complaint, although it prevails as a virulent epizootic and enzootic in other parts of the world.

Although details are lacking in regard to the incidence of the disease, it is reasonable to suppose that English cattle possess no immunity against the acute infective virus. Its non-recognition by English veterinarians may be ascribed to (1) the mild, chronic, and somewhat insidious course; (2) confusion with the vesicular disease known as "bull burnt or clap"; (3) the somewhat scant attention paid to sterility in cattle; (4) the prevalence of epizootic abortion due to Bang's bacillus.

Etiology.

In 1898, Ostertag claimed to have discovered the specific organism in a short streptococcus consisting of six to nine cocci, held together in a delicate capsule, and present in the purulent discharge and

in the deeper layers of the mucous membrane. He isolated the organism, grew it in pure culture, and produced the disease in heifers by inoculation.

It is interesting to note that swabs soaked in both mixed and pure cultures of other cocci associated with the streptococcus in the vaginal discharges gave negative results.

Ostertag went further than this; he pointed out that bacterial invasion of the uterus may take place, in which case the granules are found on the uterine mucous membrane, and the discharge from the uterus is rich in the streptococci. Ostertag's statements were confirmed by Hecker, Raebiger, Hess, and other investigators. Raebiger [8], who began his researches in 1900, considered that the streptococcus was the causal agent for the following reasons:— (1) It is always to be found in the diseased secretions; (2) Its artificial cultivations at once produced the typical catarrh; (3) The streptococci are always to be found in artifically-infected cows. The organism is said to be non-pathogenic for animals other than the ox. It stains well with Loeffler or methylene-blue, but is decolorized by Gram. It grows well at ordinary temperatures on glycerine-agar, urine-agar, and other media. While infection of the uterus is easy to understand, the fact remains that few authenticated cases have been recorded. In many cases of chronic metritis and pyometra, it is not at all clear that a specific organism, associated with granular lesions on the uterine mucosa, was present in the purulent discharge.

It is true various writers have reported isolated cases of uterine infection. It will, I think, be generally admitted that the diseases of the genital organs, more especially those of an infectious nature, require further investigation. The relation between the granular disease and epizootic abortion has not been proved, although many outbreaks on the continent and in America have been attributed to contagious granular vaginitis. Epizootic abortion is very largely due to the bacillus of Bang, which many European authorities have, so far, been slow to recognize.

Methods of Infection.— The malady is described as a venereal disease in that it is often transmitted by coition; other factors in spreading the infection are: Immediate contact (soiled tail, hind parts and channel); soiled fodder and litter, hands, boots, and clothes of attendants; grooming utensils (curry-comb), and infection from the mother during and after parturition. The quantity and virulence of the vaginal discharge are in direct proportion to the

intensity of the lesions. In young females, inoculation with virulent material is nearly always attended with positive results, the discharge is scooped up from the vagina of the diseased animal and rubbed on the mucosa of a healthy one, or sterile swabs of cotton wool on wire are used to convey the infection. Bulls and old cows are less susceptible to artificial infection, although bulls readily contract the disease by coition. I have examined large herds of cows without conveying the disease from one to another, although no precautions have been taken; in most cases the vulvar labia have been grasped with the thumb and fingers, but a wire dilator or a speculum has also been used with impunity, even in cases showing a slight discharge.

The chronic stage of the nodular disease is very seldom accompanied by a visible vulvar discharge; but it may occur after copulation. I have convinced myself that the common chronic form, unattended by redness, swelling, or increased secretion, may be regarded as non-infectious. Hess's [3] observations on this point are very important; he says that "the activity of the virus disappears with the onset of chronicity." In about 2 per cent. of cases unconnected with copulation I have observed a small quantity of pus on the vulvo-vaginal mucous membrane in the form of scanty greyish-white shreds or flakes; at other times a little pus has issued from the clitoris or has been squeezed out from below. This discharge has not, however, proved infective through the bull or in other ways, and the natural assumption is that it has no virulence.

Age.—The disease is most intense in young animals in all stages of the catarrh; they are also most susceptible to natural infection. Three-fourths of my cases have occurred amongst young cows and heifers, and a large number of young calves and virgin heifers have shown distinct granular lesions. In old cows, the nodules are usually blanched and few in number, or absent altogether.

Doubtless, the tough (pale yellow) condition of the genital mucosa in old cows renders it less liable to infection: while there is a constant tendency on the part of the granules to shrink and fade away, resulting in spontaneous recovery, the process may take several years.

It is reasonable to assume that old cows may acquire immunity from one or several attacks of the acute disease.

Prevalence.—The disease has appeared in several countries in a severe enzootic and epizootic form. In East Prussia 30,000 cows are reported to have been affected in one year; in Switzerland, in

1903-1904, 60 per cent. of the cows and 48 per cent. of the bulls were found to be diseased. In other countries, in certain areas, it has not been possible to find a healthy herd of cows. In the mild chronic form of the malady it is common, in my experience, to find 80 per cent. of dairy cows showing distinct to very slight lesions.

Incubative Period.—This depends on the activity of the virus. Inflammatory phenomena begin to appear two to three days after artificial inoculation, three to five days after coition. Two to six days is the usual period. Hess puts the interval at twenty to seventy-two hours, but records one case in which a delay of eleven days occurred.

SYMPTOMS AND COURSE.

(1) *Acute Form.*—During the first forty-eight hours the disease cannot be distinguished from other forms of vaginitis. There is swelling of the vulvar labia, increased mucus, and considerable congestion and swelling of the vulvo-vaginal mucous membrane. The cow evinces pain on manipulation, urinates frequently and scantily, strains and arches her back a little, and shows uneasy movements of the tail and hind legs. Very soon the discharge becomes muco-purulent and more or less copious; it adheres to the tail and the tuft of hairs at the lower commissure, and it is found on the floor of the stall; it is always odourless. The sticky nature of the mucus causes the pus to cling to the mucosa in flaky shreds; hence, on opening up the vagina a whitish-grey shreddy coating is found lining the canal.

In about forty-eight hours numerous small, firm, round elevations appear in the vestibule in the region of the clitoris on the infero-lateral wall. These are the granules which are so characteristic of the disease in all its stages; they are always to be seen and felt under ordinary circumstances, and the diagnosis depends essentially on their presence. They present the following characters: rounded like mustard seeds, pin's head to a radish seed in size (millet size common), dark red in colour, solid, smooth surface, discrete, and often arranged in irregular parallel rows on the longitudinal ridges of the mucous membrane.

They spread upwards over the lateral walls till they meet near the superior vulvar commissure. Occasionally they spread forward to the os, and even to the uterus. The irritation and discharge bear a distinct relation to the number of granules and the area affected.

It is important to remember that no vesicles, pustules, or sores of any kind appear on the mucous membrane in uncomplicated cases. The constitutional symptoms are slight; there may be a little fever, and the milk yield is diminished. The fatality is nil. The acute stage lasts a month or less.

(2) *Sub-acute Form.*—The inflammation subsides and the discharge becomes slight and intermittent. Angry zones or areola still surround the nodules which are now bright red in colour. This stage may last two months.

(3) *Chronic Form.*—The chronic stage may be said to set in about three months after the commencement of the disease. Its duration is quite indefinite; there is no doubt that the lesions may and do persist for several years, though there is a constant tendency for the granules to dwindle and fade; they may disappear in a few months.

According to my observations the character of the lesions may vary considerably in the same individual at different periods. Again, the granular areas still persist in the great majority of the cows which were recognized as being diseased twelve months ago.

The symptoms are, practically, those of the acute form minus the inflammatory phenomena. Discharge and signs of irritation are usually absent, the granules, for the most part, retain their former character and situation; they are usually pale red in colour, and the surrounding mucosa is quite normal, or occasionally injected and slightly reddened. No catarrh is present. Later on the nodules become blanched or colourless, like little blisters and smaller in size. Not infrequently large blanched granules are met with on the upper wall close to the vulvar commissure. Different stages are met with in the same animal. The rowed arrangement is less constant after a time, and contiguous granules sometimes become confluent, forming elongated swellings in length from a canary seed up to $\frac{3}{8}$ in. Rounded swellings are also seen the size of a hemp seed to half a split pea on the surface.

The granules show little tendency to run together in calves and young heifers; in the latter they are often rather large, discrete, and bright red in colour. Occasionally they are heaped up round the clitoris like a raspberry. On the roof of the vulva the nodules are usually few in number, small, fade more or less rapidly, and are situate close to the upper commissure $\frac{1}{8}$ in. to $\frac{1}{4}$ in. from the cutaneous covering; inferiorly the mucosa is free and smooth for $\frac{1}{2}$ in. to $\frac{3}{4}$ in. from the margin of the labia.

It follows that the granular ring encircling the tube of the vulva

is considerably broader below than above, *i.e.*, the granules extend further forward infero-laterally. Below, the breadth is commonly 1½ in. in cows, above it is ½ in. One frequently finds a few small pin-head blanched granules near the upper commissure (less often two or three larger ones), and an area of discrete, bright or pale red mustard-seed-sized granules on each side and in front of the clitoris.

I have met with several cases in heifers in which the lesions reached the neighbourhood of the os uteri along the floor of the vagina, in one case only they had spread along the roof near the os, while inferiorly they barely reached the meatus. I am inclined to regard this condition as of rare occurrence in the chronic form of the disease. It is certainly the case that the nodules show a more marked tendency to spread forward in heifers than in older animals.

The colour of the mucous membrane varies greatly, it is often very pale or blanched in young calves, pale yellow in old cows, the yellowish tint being quite normal. A diffused or streaky redness is associated with extensive lesions.

Exacerbation occurs occasionally during pregnancy, more often at œstral periods, especially if copulation takes place. The irritation induced by coition is shown by (1) angry dark red colour of the granular area and surrounding mucosa and slight swelling; (2) excessive mucus; (3) occasional tearing at the upper commissure (heifers); (4) slight coating of shreddy pus or thick sticky mucus, or both. The slight signs of uneasiness, if present, are unnoticed by the cowmen, who remain in ignorance of the condition until it is pointed out to them. These untoward symptoms notwithstanding, the animal frequently proves in calf.

For some time before and after parturition and abortion, the swollen œdematous slimy condition of the genital canal and labia renders the detection of the granules difficult or impossible. The period varies from a few days to three weeks after parturition, and for two or three up to twelve weeks in primiparæ beforehand. The nodular elevations are partially or completely buried in the swollen mucosa, in spite of which they may be felt with the fingers or even seen occasionally on stretching the labia.

It follows that a definite diagnosis cannot always be made in down-calvers and in recently-calved cows.

Mention has been made of the fact that a small quantity of pus may now and then be squeezed out of the clitoris; this pus, however, possesses no virulence, it quickly disappears and its presence remains

undetected unless periodic examinations of affected animals are made. Lastly, petechiæ are very occasionally seen on the vulvo-vaginal mucous membrane at all ages from six or nine months upwards.

Cases of Chronic Granular Vaginitis Aggravated by Copulation.

Cow (*a*) aged 4. I examined her October 9, 1909, three weeks *post partum*. Numerous pale red nodules size of mustard seed arranged in rows and extending forwards for two inches infero-laterally; mucosa otherwise normal. December 21, 1909. Six days after first service, granules dark red and apparently increased in number, mucosa injected, especially upper wall; lot of mucus, slight coating of pus on mucous membrane, half teaspoonful squeezed from prepuce of clitoris which was swollen. Swabs sent away for experimental inoculation gave negative results: staphylococci and streptococci in cover glass preparations. Irritation disappeared within ten days; cow pregnant.

Cow (*b*), aged 3. Similar to (*a*) but granular area smaller before and less irritated after copulation. No pus from clitoris, no swelling; stood bull.

Cow (*c*), aged 6. Granular area, rather larger than (*a*), but more faded, several canary seed to half split-pea sized reddish elevations near clitoris. Vulva relaxed and moist. After copulation: granules increased, bright red in colour, surrounding mucosa congested and little swollen, increased mucus, no pus. This cow was sterile, right ovary cystic, size of pullet's egg, œstrum excessive and prolonged, periods regular, becoming shorter and irregular; broad ligaments relaxed, pronounced hollow right side; crushed cysts four times per vaginam, after which she became pregnant.

In both (*b*) and (*c*) the irritation produced by the bull quickly disappeared.

Bulls—The symptoms in bulls are comparatively mild, even in the acute form of the catarrh; granules are seldom to be detected on the glans penis. In Switzerland 48 per cent. of the bulls were diseased during 1903-1904, but only one-fourth of these showed acute symptoms; the others were chronically affected. Bulls are credited with transmitting the disease without showing any visible discharge or swelling.

A purulent catarrh of the prepuce is sometimes present, a little pus oozes from or may be pressed out of the sheath, it may adhere to and become dried on the long preputial hairs. Less frequently, the

purulent or muco-purulent discharge is abundant, the prepuce is swollen and very sensitive, and granules similar to those seen in cows are found on the glans penis. The animal may refuse to copulate, or the act is performed slowly and a little blood is noticed.

I have handled about sixty bulls in the course of my investigations, and in no single instance have I found lesions attributable to the granular disease. The great majority were healthy, two or three were affected with "clap," whilst others, mostly young bulls in use for the first time, showed warty growths on the penis, or injuries due to copulation. It must be admitted that the cursory examination made in some cases may have failed to reveal slight lesions in spite of the fact that observations were made in most instances before, during, and after coition.

Some of these bulls belonged to herds in which 80 per cent. of the cows and heifers were chronically affected, yet they continued to serve healthy and diseased alike without conveying the infection.

It would appear, therefore, that the symptoms in bulls in the chronic form are negative or very slight, and further, that this form of the malady is not venereal in the proper sense of the term.

The clinical diagnosis of a suspicious genital discharge in bulls may, in some instances, prove rather difficult; in cows, on the other hand, differentiation is usually quite simple.

The fact should be borne in mind that a profuse preputial purulent discharge in the bull is often due to a totally different disease, commonly termed "bull burnt." Like the granular disease, this affection is sometimes transmitted in other ways than by coition, and pregnant animals may become infected if brought in contact with the virulent discharge.

Differential Diagnosis.

The scanty literature at our disposal in regard to venereal diseases of cattle is regrettable in that it may lead to confusion in their differentiation. The literature is not only scanty, some of it, especially that of older writers, is positively misleading, *e.g.*, the etiology and differential symptoms of so-called bovine gonorrhœa have not received the attention they deserve.

It is highly important that the two infectious genital diseases, vesicular vaginitis or "cow-clap," and contagious granular vaginitis should be clearly distinguished. I am of opinion that the differential diagnosis in the cow is difficult only (1) during the first two or three days, before the pathognomonic granules appear in the latter disease;

(2) when both diseases affect the same animal simultaneously. My experience has been that they may easily co-exist in the same animal.

At one time [9] the idea gained ground that the granular areas on the vaginal mucous membrane were in reality the result of an acute (vesicular) vaginitis which had assumed a chronic form. This statement, the fallacy of which has been proved by clinical observation, shows the amount of confusion which has existed.

Vesicular Vaginitis.

Synonyms.—Eruptive or benign venereal disease, vesicular exanthema.

This is a mild and fairly common affection in cattle which cannot be distinguished from what is ordinarily known as gonorrhœa, bull-burnt, or cow-clap. Rightly or wrongly I have been accustomed to regard it as the form of gonorrhœa affecting cattle. A series of experimental inoculations on a large scale, with a sufficient number of controls, would afford valuable evidence for or against this hypothesis.

In my cases a distinct urethritis has been present in male animals, and in females the meatus has been frequently involved. The late Professor Walley in his lectures defined gonorrhœa as a specific urethritis in males or vaginitis in females, the positive symptom being the formation of a crop of pustules followed by ulcers on the mucosa.

In the vesicular disease the ejection of urine is distinctly irritating to the animal, it is voided very frequently in small quantities, the straining, arching of the back, elevation and whisking of the tail, together with the discharge of muco-pus from the urethra in bulls, all point to the urethra being involved in the inflammatory process. Accompanying the ordinary symptoms of vaginitis, there is at the outset a vesicular eruption on the mucosa; the vesicles, which are rarely observed in the natural infection, are rapidly followed by crops of pustules and slight superficial sores or ulcers. The genital canal is lined with a grayish-white flaky coating of slimy pus, beneath which the mucous membrane is intensely injected, angry-looking, and swollen. It bleeds readily on examination.

In bulls there is a purulent catarrh of the prepuce, or balanitis, associated with swelling, tenderness, stiffness, and more or less abundant discharge. The penis is also inflamed and ulcers may be observed. Copulation is distinctly painful and draws attention to the condition, there is usually some blood during the act.

Spontaneous and complete recovery often occurs in cows in about three weeks, though proper treatment is advisable to shorten the duration of the malady and to guard against its sequelæ. The inflammatory phenomena may disappear after a few days.

The vesicular disease resembles the acute granular disease in the following respects: (1) inflammatory phenomena; (2) incubative period; (5) method of infection; (4) one attack confers no immunity.

It differs in that (1) its duration is much shorter, granules never appear at any stage if the disease exists alone; (2) it is widely distributed in Great Britain, and it is said to be communicable to other animals by experimental inoculation, the granular affection is not. In a word the chronic course of the granular disease and the absence of pustules and ulcers serve to differentiate it.

Several outbreaks of the vesicular-gonorrhœal disease have come under my observation, in females especially they have been quite mild in character; the cows gave less milk for a few days, but most of those infected by coition proved in calf. There was very little rise in temperature. The bulls showed more fever, loss of appetite, and stiffness, and they did not recover so quickly, due, in my opinion, to the urethra being involved.

The following cases of the double infection are interesting:

CASES OF CHRONIC GRANULAR DISEASE INFECTED WITH "CLAP."

Herd A, consisting of fifty-seven dairy cows and heifers (1st calf), and two bulls. One of the bulls was young, and had not yet come into use. The herd had been under observation for eight months for granular disease: twenty-nine of the younger animals, average age 4 years, were rather extensively affected, others showed slight lesions, some very slight indeed. Total number affected, 70 per cent. Examined February 26, 1910, found old bull and three cows with swollen genitals, and a muco-purulent discharge.

Cow (1). Aged 5. Bulled 21st, swelled 24th, discharged 25th, on the 26th vulva much swollen and œdematous, egg-cupfull of yellowish-white slimy pus in channel behind cow. Granules rather obscured by discharge and swollen congested condition of mucous membrane, only to reappear as prominent as ever as the inflammation quickly abated. Raw ulcerated condition of patches of the mucosa, covered with shreddy pus, and bleeds readily. The granular area before the fresh infection covered most of the vulvar mucous membrane and extended half way towards the os uteri along the floor of the vagina. She was temporarily sterile, due to cysts in right ovary; œstrum was excessive (mild nymphomania) and irregular. The cysts

were crushed some three weeks later, the operation being repeated for the third time in twenty-eight days. At the second subsequent (normal) œstrum she went to bull, and became pregnant.

Cow (2). Aged 3. Granules mostly bright red in colour and size of mustard seed, confined to vestibule. Bulled 25th. On 26th mucosa little hyperæmic, excess of mucus. On 27th, labia little swollen, granules quite distinct, signs of irritation during micturition. 29th, symptoms as above, but less acute. This heifer calved six months ago, and had not been in œstrum; previous examination had disclosed two yellow bodies the size of a winter bean in the left ovary. These were pressed out per vaginam in three weeks' time, with the result that œstrum appeared within ten days. The corpora formed again, but did not recur after a second operation; normal œstrum and conception occurred in twenty-one days after first heat.

Cow (3). Aged 2½. Three months calved, previous examinations showed her to be free of chronic granular vaginitis, hence she may be regarded as a control. Bulled February 23, 1910. Examined 26th. Characteristic symptoms, already noted, of vesicular disease present, most acute sixth day. No granules present before or afterwards. The genital canal was covered with dirty-white pus almost like a false membrane, beneath which the mucosa was intensely congested and ulcerated. Pain in micturition was shown by dribbling of urine, straining, paddling of hind legs, elevation and uneasy movements of the tail. The internal genitalia of this heifer were normal, and she conceived at the first service in spite of the infection.

Bull. Examined 26th. Showed marked symptoms, already described, of inflammation of prepuce and penis, with ulceration. Temperature 103·6. Appetite rather poor, thin yellowish discharge becoming thick and nearly white or creamy. Painful micturition. This bull had served six other cows previous to infecting No. 1. On the 19th he had two cows, one belonged to the herd and was rather severely affected with chronic granular disease prior to copulation; the genital mucosa was a little injected and moist for some days afterwards, nevertheless, she proved in calf. The other cow was a strange one from a distance. There is little doubt she brought the infection on the farm, though I was unable to verify the fact.

I was able to keep the cows under observation without adopting any treatment; the bull, however, had the sheath irrigated twice daily with ¼ per cent. of bacillol, and pessaries containing 6 per cent. bacillol were inserted every night. He was shown a cow in season after four weeks, at which time he seemed all right. Two weeks later he was used with impunity.

Remarks.—Before seeing cow (3) and making a careful examination of the bull, I came to the conclusion that I had at last come across a genuine outbreak of acute granular vaginitis. It seemed to me that the home cow served on the 19th had infected the bull acutely. The ulcerated condition of the bull's penis, together with the absence of granular lesions in cow No. (3), showed this hastily-formed opinion to be erroneous. I might mention, also, that whilst engaged in testing this herd for tuberculosis I conveyed the infection from the bull to a genitally-sound cow and to a heifer; both contracted the vesicular disease like No. (3) but in a milder form. Recovery occurred in a few days. The heifer was pregnant and carried her calf the full term. Other outbreaks of the vesicular-gonorrhœal disease have occurred on other farms at somewhat long intervals during the last few years. The same observations apply to them except that the granular lesions, if present, were not looked for and were not observed. In one large farm (ninety-four cows) the same bull served seven cows at intervals of a day or two and infected every one of them. They all proved to be pregnant. Lysol in ½ per cent. solution was used to irrigate the parts.

Therapeutics.

Contagious granular vaginitis is to be handled as an infectious disease on the usual lines, disinfection and isolation being essential for its control and eradication. The earlier stages of the malady call for curative and prophylactic measures somewhat similar to those recommended for epizootic abortion: (1) antiseptic irrigations of all animals, diseased and healthy; (2) cleansing and disinfection of the external genitals, tail and hind quarters; (3) disinfection of the cowsheds or other infected buildings, especially floors and gutters or channels; (4) isolation of diseased, suspected, or newly-arrived animals; (5) cessation from breeding for a reasonable time, six to eight weeks (three months after abortion).

The later or chronic stages do not appear to require any treatment. Raebiger [8] carried out classic experiments from 1900 to 1906; after exhaustive investigations he found that a creosote preparation named bacillol most nearly fulfilled the requirements of a reliable, cheap, and (comparatively) non-irritating antiseptic for irrigation purposes. A 1½ per cent. solution killed the streptococci in one minute, while strong solutions proved less toxic than other preparations. Personally, I have used bacillol largely in ¾ per cent. solution for both vaginal and uterine irrigation with excellent results. Lysol

is more soapy in character, and is to be preferred, but it is too expensive for general use. Two per cent. solutions of these disinfectants, together with creolin and a host of coal-tar derivatives, are too strong for tender, sensitive genital mucous membranes, both male and female; I have repeatedly observed, more especially in young animals, irritation and straining with tendency to adhesions or stricture from solutions of this strength employed twice daily for two or three weeks. Williams' [5] researches emphasize this fact, and show that irritation produced in this way interferes considerably with subsequent more rational treatment. The harm sometimes done by strong injections is also referred to by Hess [3A].

In dealing with a small number of cows, thorough flushing out of the vagina is most conveniently effected by means of a hard metal syringe holding about 1 quart, strongly made for rough usage, the nozzle or injection pipe 6 in. long, and thick to avoid injury to the vagina or os from careless holding, the distal end slightly bulbous and pierced with numerous holes so as to produce a fine spray in every direction without too much force. For bulls, an extra long Higginson's enema or milk fever syringe with special metal nozzle, or the following appliances used for cows may be employed. Instead of the special vaginal syringe a gravity apparatus is used consisting of a large funnel, several feet of rubber tubing with a canula attached. A rubber tube 10 ft. in length $\frac{5}{8}$-in. bore and $\frac{3}{4}$-in. outside diameter is to be recommended for both vaginal and uterine irrigation used with a funnel, attached to any enema pump, a pail or tank fitted with a stopcock, or with a sufficiently large tube holder and suction plate to keep it down and prevent kinking. It is sometimes possible to suspend a large pail above and behind the cows and to pull it along the shed; this facilitates the work very much in large herds and economizes the cowmen's time.

The irrigations with mild warm solutions are carried out twice daily for a few days, then once daily, becoming less frequent after two to three weeks. After washing out the whole vaginal canal, bacillol ointment 6 to 10 per cent. is used once daily for a time in capsule or pencil form; the pessary is best introduced as far as possible with the fingers. This is Ritzer's method of using the ointment; Raebiger has invented a special ointment syringe for the purpose. The pencils are cheapest and they give good results in other vaginal affections.

It is highly necessary to prevent the animals copulating till all inflammatory phenomena have disappeared, and for a short time afterwards, roughly six weeks. The irritation sometimes produced

by coition, even in the chronic cases, has already been alluded to. Recovery is retarded, and infection may be conveyed in this way. It is good practice to syringe out the vagina with a 1 per cent. solution of bicarbonate of soda before going to bull, in case an acid or neutral state of the mucus exists; the reaction should be feebly alkaline, and various conditions of the genital tract may alter this.

Little more need be said in regard to prophylaxis. If the sound animals are few in number, and other premises are not available, they should occupy stalls apart from the other cows to which the drainage does not flow, *e.g.*, at the higher end of the shed. The sound cows should be dressed first, and all fresh arrivals disinfected and kept under observation. A garden syringe is useful for spraying the hind parts after cleansing the soiled vulva and tail.

It is worthy of note that recovery is not necessarily associated with the disappearance of the granules, though they often do disappear if prompt and rational treatment is adopted. If they persist they are small, blanched, and probably few in number.

As an experiment, I applied the bacillol treatment to one rather severely-affected herd for four weeks as follows:—

First week.—Daily injections $\frac{3}{4}$ per cent. solution and pencil ointment 6 per cent.

Second week.—Daily injections, pencils every second day.

Third week.—Injections and pencils three times per week.

Fourth week.—Two injections only.

Result.—No irritation, distinct fading (loss of bright red colour), of granules in a number of young cows, probably fewer in number. The older cows showed little alteration.

Sequelæ of Granular Vaginitis—Abortion and Sterility.

We have seen that the disease in the individual is comparatively mild, attended with little constitutional disturbance, and of short duration in the acute stage. Its results, however, according to European investigators, are very serious indeed. Many careful observations have been made, particularly by Hess, whose excellent work deserves all praise. It is held that serious economic loss is produced by the extension of the catarrh to the uterus, and that both sterility and abortion are common in severely-affected herds. That an infective lesion in one part of the genital canal may extend to another by continuity will be readily admitted, at the same time the number of the uterine infections is not stated, and some writers seem to attribute almost every disease of the genital tract to this

malady. Their facts are beyond dispute, the deductions drawn from these facts are, perhaps, open to criticism.

My point is that the granular affection in the virulent form has a place, and an important place, in the production of sterility, and it may be abortion, but the tendency is to magnify its importance as an etiological factor. Hess [3] states the case very fairly when he says: "It is not a matter of doubt that lack of desire and impotence, as well as some ovarian and uterine diseases, a cystic degeneration of the ovaries, mortification and maceration of the fœtus, abortion, chronic catarrhal and purulent endometritis, occur equally in infected and non-infected genital organs, and declare themselves by quite similar symptoms, on which account their etiological significance is at times surrounded with great difficulty."

Abortion.

The relative importance of contagious granular vaginitis in the production of abortion has been variously estimated, and probably over-estimated. It is certainly the case that a purulent catarrh of the uterus, secondary to specific lesions in the vagina, or dating from the last parturition, destroys the intimate union which exists between mother and fœtus, and causes the latter to be expelled as a foreign body.

Invasion of the uterus is most likely to occur during œstrum through the open cervical canal: if impregnation takes places abortion will very probably take place during the first few weeks of pregnancy. An endometritis may already exist, and conception may possibly take place, in which case the fertilized ovum is unlikely to have a long intra-uterine life.

In discussing the etiology of granular vaginitis, I ventured the statement that the number of authenticated cases recorded of granular uterine infection is small, it now appears that the number of abortions attributed to it is very large. Many European writers are, or have been, of opinion that it is responsible for much of the abortion which prevails in an epizootic form. If the nodular disease is mild, the latter is small or *nil*; on the other hand, if the nodular disease is severe, it is credited with producing all the abortion in the affected herds amounting to 20 to 70 per cent. of the total number of cows. At the same time it is admitted that in other severely-affected herds no abortions at all have occurred.

One is struck by the lack of information in regard to other possible causes. To establish the above hypothesis it seems to me that three

things are necessary: (1) General recognition by bacteriologists of Ostertag's streptococcus or some other organism as the causal agent; (2) the demonstration of the specific organism and the granules in the uterus; (3) the transmission of the disease to the other animals by experimental inoculation.

It is hardly necessary to say before a gathering of English Veterinarians that by far the largest number of abortions in this country are due to Bang's bacillus of cattle abortion. The identity of the English and Danish disease has been established by the Departmental Committee of the Board of Agriculture. It is natural to suppose, therefore, that much of the epizootic abortion which prevails on the Continent and in America may be due to the bacillus of Bang, in spite of the fact that this organism has so far received scant attention as an etiological factor.

In my own practice I have kept a record of 300 consecutive cases of abortion: 80 per cent. of these have been clearly due to Bang's bacillus, judging by (1) character of the exudate; (2) microscopic examination of fœtal cotyledons; (3) appearance of the after-birth; (4) history and number of cases in the herd. The average period of gestation was six to six and a half months, and the average age four and a half years. All these cows were sent to isolation farms, most of them when they were showing premonitory symptoms, and their arrival was notified to me in every instance.

It is a well-known fact that epizootic abortion (Bang) is largely a disease of heifers and young cows, the same applies to the abortion produced by the granular disease. The latter, however, occurs at any period, often within twelve weeks of fecundation, whereas most cases of epizootic abortion occur between the fifth and seventh months of pregnancy.

I have not found severe granular lesions in slipped cows or heifers, although a number of these have been examined at various periods both before and after the act of abortion. On the contrary, the signs of chronic granular vaginitis have been comparatively slight and insignificant, although a chronic purulent endometritis leading to temporary sterility has been a common sequel of the abortion. Moreover, I have not found any relation between the extent of the lesions and the number of abortions, in either freshly-infected or older-infected herds.

Sterility.

It is generally accepted that sterility stands in intimate relation to the evolution of the milch cow and the forcing methods adopted

at the present day. It certainly appears to be on the increase in this country.

While sterility occurs without infection of the genital organs, it is considered to be closely related to and to follow severe attacks of contagious granular vaginitis. Many European investigators and writers agree on this point—*e.g.*, Zschokke, Raebiger, Hess, Hutyra and Marek, Neilson, Ostertag and Thoms. Their observations and statistics show that a much larger number of ovarian and uterine diseases are met with in severely-infected herds; and further, that the number of sterile animals affected with granular disease is considerably greater than the number of non-infected animals.

At the Ninth International Veterinary Congress at the Hague on September 19, 1909, Hess [13] stated that so far as his observations went, out of every 100 cases of sterility in cows, fifty-eight were due to this disease. He [3] points to infected herds in which the pregnancy figure is only 20 per cent. Hess also considers that apart from the extension of the catarrh to the uterus, the protracted hyperæsthesia of the posterior genital tract in itself hinders conception.

In other words, a chronic irritation at one end of the genital canal is said to inhibit ovulation and fertilization at the other, or to produce a definite pathological lesion such as a cyst or an enlarged corpus luteum in the ovary. It is difficult to understand how this may happen. If the vaginal mucus gave an acid reaction non-conception would be easily explainable, but this apparently is not the case.

The diseases of the genital organs attributed to the granular catarrh need not detain us here, and I propose to do little more than enumerate those most frequently met with: ovarian cysts, persistent or hypertrophied corpora lutea, occlusion or thickening of the oviducts, metritis and endometritis in various forms without pyometra; thickening, occlusion, and alteration in shape of the cervix. These diseases produce sterility in various ways, many of them are the direct result of normal parturition, or abortion with retained placenta, or faulty involution of the uterus. If conception occurs, death and maceration of the fœtus may ensue, followed by a muco-purulent discharge, and possibly abortion or pyometra; on the other hand, the fœtus is sometimes carried full-time or over-time. Abnormal œstrum usually accompanies sterility, there is extra heat or very slight œstrum, irregular periods, nymphomania, or absence of œstrum ("dumb bullers").

In Switzerland [11] a record was kept of 300 cows, in which the cause of sterility was definitely ascertained; 173, or 58 per cent.,

suffered from infectious granular catarrh (only eleven acutely), while 127 were free of the disease. Of the infectious cases, 75 per cent. of the 173 cows were between 3 and 6 years old; ninety-one, or 57 per cent., had diseased ovaries, either cystic degeneration, or hypertrophied yellow bodies; the remainder, eighty-two in number, gave the following results: Endometritis, forty-six (twenty-four due to abortion); pyometra, 21; absence of œstrum, six; acute granular lesions, eleven.

It is instructive to compare these figures with those pertaining to the 127 sterile cows unaffected with granular disease; 73 per cent. showed ovarian disease (against fifty-seven), and 62 per cent. of these had cysts (against forty-two).

Hess's observations show that, in Switzerland, at any rate, ovarian disease is common, and that it is primary; endometritis is not often associated with it.

Albrechtsen, on the other hand, takes the opposite view, both in regard to the relative frequency of uterine and ovarian diseases, and the influence of infectious vaginal catarrh on the genital organs. This observer lays stress on the frequency of uterine ailments as a cause of sterility; he regards the endometritis as primary and the cyst secondary. According to Albrechtsen [4], "infectious forms of vaginitis play a proportionately small *rôle* as causes of sterility in the cow; acute vaginitis, with severe symptoms, is rather easy to cure, and seldom causes sterility. Chronic vaginitis follicularis is a very harmless affection which bears no causal relation to coexistent sterility."

My own observations are confined to the mild chronic manifestation of the disease, which, as we have seen, is an insignificant and, comparatively speaking, harmless affection. I began my examinations in dairy herds in which the sterility figure, both relative and absolute, was high—10 to 20 per cent. Many of them were young animals, the ovaries were largely cystic, and granular lesions, usually more intense in the heifers, were present in 80 per cent. of the females. The internal genitalia of the non-pregnant animals in each herd, examined *per rectum*, revealed a considerable amount of disease, mostly in the ovaries and the uterus. In other herds, in which the vaginal mucosa alone was observed, the number of affected animals averaged 60 per cent., the lesions were, on the whole, very insignificant, and the sterility figure varied from 1 to 6 per cent.

These early examinations, together with a perusal of the literature on the subject, led me to believe that the prevalence of sterility in a herd bore a distinct relation to the intensity of the granular lesions, and to the percentage of animals affected.

Further observations in other herds and in other districts did not confirm this opinion, and at the present time I am not at all sure that the mild form of the disease has any appreciable effect on the reproductive organs. My case-book shows that forty-one cows, average age 5 years, have been handled for sterility during the past year, either operated upon *per rectum* and *per vaginam*, or treated medicinally, or both. Most of these were absolutely sterile, a small number was relatively so, having had the bull four or five times or more without proving in calf, or showing no œstrum for a long period. A number of others were merely examined, and afterwards fattened and sold. The forty-four females included twelve heifers (one calf).

The ovaries were affected in 55 per cent. of cases, occasionally accompanied by asymmetrical enlargement of the uterus (catarrhal endometritis). The interesting point here is that one-third of the animals showed no granules in the vagina; in the others the granular areas, excepting in some of the heifers, were faded and very slight indeed.

Turning my attention to calves and young heifers, I found a large proportion showing distinct nodules unaccompanied by irritation of the mucous membrane in almost every instance. The proportion of affected calves increased as age advanced, although the percentages varied considerably in different herds approximately the same age.

The method of infection was by no means clear, unless the fodder or bedding carried the virus; the stockmen did not enter the cowsheds, and in most instances the calves, after weaning, were kept on premises apart from the stock.

The following figures relate to 120 calves; they are rough averages:—

Two to three weeks to four months,	10 to 30 per cent. affected.
Four months	40 per cent.
Five to nine months	50 to 55 per cent.
Twelve to fourteen months	60 per cent.

Several hundred heifers, about 18 months, shortly before going to bull, have given a percentage of 65 to 70.

Cows and heifers after first calf, 80 per cent.

The lesions become less and less apparent as age advances, until, in old cows, they are either absent or very slight, small, and blanched. It follows that the disease affects large numbers of females, especially young females; it is chronic from the outset, and it apparently does little or no harm. The fact that the disease is present in heifers

before they go to bull is significant. In this connection Williams [5], who has done valuable work in America, states from personal observation that "sterility is very common and ruinous in herds where the disease is already present in the virgin heifers, and the basis for the sterility is laid prior to the coition." It is interesting to note that small ovarian cysts are not uncommon in virgin heifers that have never been bred, and I have found these to occur equally in infected and non-infected animals. In herds kept under observation, heifers after the first calf usually stood the bull the first or second time; the presence of granular lesions in the vagina did not affect conception to any appreciable extent.

In young heifers first time bred, sterility has been still more uncommon, although a case of nymphomania due to cystic ovary, or a "spurious pregnancy" due to pyometra, has occasionally occurred, nor has the so-called "invisible abortion" been at all common during the first few weeks of pregnancy, although at later periods in gestation epizootic abortion (Bang) has caused much havoc in some herds, up to 34 per cent. (12 out of 35 young heifers).

It must be remembered that the effects of the nodular disease may remain after the primary vaginal lesions have faded. Bearing this in mind, I have not been able to trace a higher percentage of subsequent sterility in young animals in which the vaginal lesions were extensive.

Twelve months is, of course, far too short a time in which to form a definite opinion based on personal observation. A series of extended observations in widely separated districts would furnish information of considerable value to breeders and to veterinary surgeons interested in sterility, particularly if statistics as to genital soundness were obtained by rectal examination.

I have made a systematic examination *per rectum* in a few herds to determine the relative frequency of disease in affected and non-affected animals. It was my original intention to submit these and other data here, they are, however, rather voluminous and hardly germane to this paper, inasmuch as they do not establish a causal relationship between sterility and abortion on the one hand, and chronic granular disease on the other.

In conclusion, I have to submit the following suggestion, "That the National Veterinary Association shall form a committee to ascertain if contagious granular vaginitis actually exists in a virulent form in this country, to note its effects, and to report to the next meeting." If the terms could be extended to include sterility in cattle. I feel sure valuable results would ensue.

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THE TENDENCY OF ANIMALS TO DEGENERATE.

IN all improved breeds of live stock there is ever present a tendency to degenerate. This is a law of heredity, as these animals have been bred up from inferior original stock, and there is a constant inclination for the old original scrub blood, always to be found somewhere away back, even in the best pedigrees, to reassert itself. This tendency is only counteracted by the care of the stockman to meet it by the most careful selection of superior types on both sides. There is in this fact a thought for every breeder. Inferiority of any kind in breeding stock is a defect which has been inherited, and is, therefore, very apt to be transmitted. The only safe way to meet it is to study out where the faults of an animal are, and to meet them with a cross with another which is, in that particular, strong and good. If the breeding mare which you own has several weak points in her conformation, as most animals have, it is well to study them. Pick out the worst ones, and even if it cost you more money, mate her with a stallion which shows no tendency towards the same lack of excellence.—*The New Zealand Dairyman and Farmers' Union Journal.*

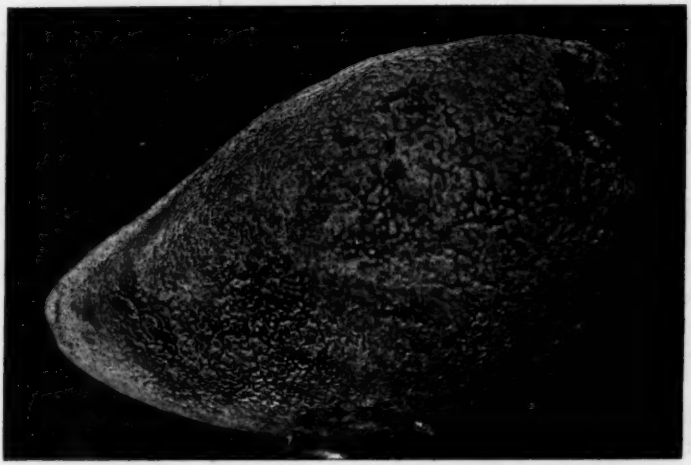
Clinical Articles.

AN UNIQUE SALIVARY CALCULUS.

By H. P. LEWIS, M.R.C.V.S.,

Chelmsford.

The subject of this extraordinary calculus was a dark brown pony, about 16 years old and 14 hands high. The pony was brought to to me for advice about the "lump" on its jaw. I advised its removal, which met with the owner's consent. The pony was cast, and an incision about 6 in. long made into the sac containing the calculus, which was removed without difficulty. An examination of the sac



showed that this was formed by the distended salivary duct, which was supported on its lower border by fibrous tissue, about an inch in thickness. The wound healed in three weeks, and the pony worked for eighteen months in this district, when he was sold, and I lost sight of him. My chief reason for putting this case on record is, that I believe it to be the largest salivary calculus in existence: its dimensions are:—length 4¾ in., diameter 2½ in., circumference 8½ in., weight 1 lb. 8½ oz. on removal.

AN ASIATIC BREEZE-FLY.

(*Tabanus albimedius*, Walker).

By A. W. NOEL PILLERS, M.R.C.V.S.,

Sheffield.

Through the kindness of Captain J. J. Griffith, A.V.C., Bangalore, India, I am able to give an account of the above-named fly from a number of specimens recently received. The number of species in the genus *Tabanus* is so great that it would be impossible for an account of each species to be given in our standard books on veterinary parasitology. The fly in question, however, would appear to be so common in southern India and Ceylon that most veterinary surgeons must have come across it, although it is little mentioned as a harmful species. It is about 15 to 18 mm. long, and of a dirty-brown colour; the body is broad, with a large head, which is depressed from before to behind, the wings are extended horizontally, and provided with a great many nervures. The proboscis is short and thick, and the last article of the short antennæ is cresentic-shaped.

The fly is usually seen at the advent of the rains during May and June, or even earlier; the districts it seems to prefer may be described as woody, and natives say that it rests in the trees or roofs of the stables. It is said that the flies are most troublesome during the evenings, at dusk, or before a storm of rain. This is true of many flies. The Tamil name is "croothe," which means "big eyes," a prominent feature with all this group.

The animals attacked are horses, mules and oxen, and it enters the stables. The favourite site would appear to be the region between the knee and the fetlock on the outside. They do not remain long after alighting, because their mouth-parts are very sharp, and the animals soon seek to dislodge them by stamping violently. In this country the members of this group often alight on parts of the body where the skin is much thinner, and where they are less likely to be dislodged by the animal's head. Other parts attacked are the flanks and belly. As a result of the bite, the fly takes up some of the animal's blood, and, depending on the state of its proboscis, various changes may be brought about in the wound. Usually, however, a swelling about the diameter of a shilling results, and this gradually disappears. Sometimes, however, the animals bite the elevations, making them into sores, which the natives treat with a solution of salt in water. It is quite possible that the fly may transmit disease in a mechanical way.

ENDOTHELIOMATA IN A BULLOCK.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.

Melbourne University, Australia.

The case was brought under my observation at the Melbourne City Abattoir. The animal was an old working bullock, diagnosed as tubercular before slaughter. On *post mortem*, however, the naked-eye appearances of the lesions differing markedly from tubercle, the head and neck, to which the new growths were apparently confined, were retained for my examination.

In the space posterior to the angle of the right inferior maxilla was a large flattened, ovoid tumour measuring 6 in. in length, 4 in. in breadth, and about 2 in. in thickness. Attached to its postero-inferior border by a short pedicle was another walnut-sized tumour also flattened. So far as could be definitely determined the growth did not arise from any of the groups of glands in the vicinity; at all events there were normal lymphatic glands situated in the parotid, submaxillary, and retro-pharyngeal regions. The neck of the same side, however, showed four distinct tumours lying in line and corresponding to the lymphatic glands. The largest of these was the size of a large orange, and was situated about 4 in. below the first described growth. The others were of gradually decreasing size, that situated at the entrance of the chest cavity being about the size of a walnut.

The tumours were all definitely circumscribed. On section they were dense and almost fibrous. The cut surface exuded a small quantity of colloid-looking material; the appearance was greyish and fairly homogeneous, but many small fibrous trabeculæ could be observed infiltrating the tissue. Small hæmorrhages, near the periphery especially, were numerous.

Microscopical Appearances.—The new growths are composed of a stroma of dense fibrous tissue bands passing inwards from the capsule, branching and anastomosing to form alveoli of varying size. These alveoli are filled with large ovoid mucleated cells, well provided with cytoplasm. These cells have not on the one hand the characters of epithelium, and on the other are quite distinct from ordinary cells of lymphoid tissue. They are apparently endothelial in nature and origin. New blood-vessels are fairly numerous, and in the larger alveoli may be seen almost centrally situated, the lumina being large and the walls extremely thin. Many of the alveoli, particularly those near the periphery, contain recently extravasated

blood corpuscles lying free amongst the tumour cells. No areas of degeneration are present.

The new formation can hardly be included amongst the ordinary sarcomata, even the alveolar sarcomas. Although there was no naked-eye evidence that the largest tumour situated in the parotid region had originated in a group of lymph glands, it seems most probable that the origin was actually one of the small glands so numerous in that region, the endothelial cells having acquired the power of multiplying and producing a malignant new growth. The fibrous tissue new formation which is such a marked feature in sections can probably be best accounted for in the same way as the fibrous stroma of cancer. It generally appears quite distinct from the cells within the alveoli.

Unfortunately the viscera were destroyed before my arrival, so that an opportunity of carefully examining the lungs, spleen, &c., for metastases was lost.

ENDOTHELIOMA OF THE MEMBRANA NICTITANS IN A HORSE.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.
Melbourne University, Australia.

The membrana nictitans of a horse described in this note was received from Mr. J. B. Leitch, G.M.V.C., Veterinary Surgeon, Geelong.

The membrana showed two growths situated close together, ovoid in shape, flattened on the external and internal surfaces, one about ¾ in. long, the other somewhat smaller. The mucous membrane was not implicated. The borders were indistinct, gradually merging into what appeared to be healthy tissue.

Microscopical examination of sections disclosed an unusual form of new growth, the following being the general appearance :—

New blood-vessels are numerous. The bulk of the new growth consists of large epithelioid cells, chiefly distributed in more or less irregular groups, separated by, and here and there infiltrated with, smaller lymphoid cells possessing little or no cytoplasm. Each mass or group of larger cells is generally arranged around a new blood-vessel more or less centrally placed. In the smaller areas the wall of the new blood-vessel is extremely thin, and is composed simply of a layer of slightly flattened cells of the new growth. In the older and larger masses the blood-vessels are still seen to be composed of the

same kind of cell, with the exception that several circular layers of flattened cells form the vessel wall, these gradually merging into typical cells of the growth. The lymphoid cells are lying in an extremely fine network which forms a kind of stroma to the tumour.

The large cells which form the bulk of the new growth are oval, with spherical and oval nuclei surrounded by a considerable amount of cytoplasm, but showing no tendency to form any fibrous tissue.

The size of the large cells, the definite cytoplasm, and their intimate connection with the new blood-vessels, all point to their origin being the endothelium of the capillaries of the region, and that the tumour in question may be best included amongst the endotheliomata.

Mr. Leitch advises me that tumours of the membrana nictitans in horses having similar naked-eye characters and clinical history to that described are not uncommon, though much more uncommon than the papillomatous and carcinomatous growths with the typical soft, warty appearance. In this case the animal was an aged draught horse and the tumour had only been observed for five or six weeks prior to Mr. Leitch being called in and operating. The growth was smooth and not ulcerating, but was of a deep red colour. No recurrence has followed the operation so far.

THE NEWLY-INTRODUCED ROARING OPERATION. AN IMPROVEMENT AND A WARNING.

By F. G. HOBDAY, F.R.C.V.S.,
Kensington, W.

Having read in the veterinary periodicals at different times during the past few months several detailed descriptions of the ventricle stripping operations for the relief of roaring in horses, and feeling in some measure personally responsible for one of the errors therein, I should like to make an announcement of an improvement which experience has taught me, and which Dr. Williams has, I believe, now adopted, in the method of incision. It is a well-known fact, both in human and veterinary surgery, that in all operations upon the larynx one of the chief things to avoid is the infliction of the slightest damage to the cartilaginous structures. This is partly on account of the risk of stenosis, and partly from the danger of the formation of granulation tissue as a sequel.

The late Dr. Fleming, in his standard work on the subject of roaring, when describing the operation incision, advises cutting through the crico-thyroid ligament, the cricoid cartilage, and even one, two, or three tracheal rings; and in THE VETERINARY JOURNAL for January of this year, in the preliminary note I published of the operation, I described the division of the thyroid cartilage with a saw, in accordance with the steps Dr. Williams took when he kindly demonstrated to myself and the other English veterinary surgeons who were present at the time.

I now find that it is not at all necessary to cut any cartilage, neither the thyroid nor the cricoid, as the incision which can be made through the crico-thyroid ligament alone gives ample room in any horse for the stripping of the ventricle.

This assertion is based on the experience of more than one hundred separate operations, and cannot be too strongly emphasized, as in itself it does away with any fear of granulatory projections, at all events from this source, and a careful operator has no difficulty in avoiding injury to any of the cartilaginous structures.

SALT FOR STOCK.

A POINT of some importance for keeping stock healthy is the providing of rock salt to cows in the pasture field. In an ordinary cattle ration there is about ¾ oz. of salt, but a milk cow requires a good deal more than that. The milk drains away fully an ounce per day out of system, and unless this is supplied the ash material of their vegetable food does not yield enough. It is most instructive to watch how regularly a cow will come for her "salt lick" once she knows where it is to be found, and at the end of the grazing season there is a very noticeable difference between cows who have had regular access to salt and those who have not. Penkeepers as a rule observe this point, but small owners of stock very seldom think of supplying salt to their animals. The licking of the rock salt induces a flow of saliva, and to give salt in this form is better than giving salt in the food where animals are hand fed.—*The New Zealand Dairyman and Farmers' Union Journal.*

Abstract.

GOVERNMENT CERTIFICATION OF STALLIONS IN VICTORIA, AUSTRALIA.[1]

By S. S. CAMERON, D.V.Sc., M.R.C.V.S.

Chief Veterinary Officer for Victoria.

In 1907, the then Minister of Agriculture (the Hon. Geo. Swinburne, M.L.A.) approved of the establishment of a system of Government control in respect of stallions standing for public service, directed primarily towards insuring the soundness from an hereditary standpoint of all stallions in the State, and also that such stallions should conform to a reasonable standard of excellence as regards breed, type, and conformation. The system has now been carried out through three seasons, and it is proposed to review its operation and administration during that period.

It may be said at once that, in this review of the work of the past three years, it will not be claimed that a definite and measurable improvement has already been attained. It will be some years more before the real benefit of this three years' work will be appreciable. It is true that about one-fourth of the stallions examined have been refused the Government Certificate, but it will not be possible to estimate the improvement that can be effected until power is given by legislative enactment to prevent or limit the use of rejected stallions. What may be claimed, however, is that in the three years examinations have shown:—

(*a*) That unsoundness of an hereditary character exists to a considerable extent in the stallions standing for public service. (The figures in the Table of Totals herein show 15·83 per cent. of rejects for hereditary unsoundness).

(*b*) That there is a considerable proportion of sires at present in use unfit for the purpose by virtue of their mongrel characteristics.

These two features having been demonstrated, there need be no hesitation in affirming the necessity of completing the scheme by legislative enactment.

During the first season (1907) the scheme was on a voluntary basis. It provided for the purely voluntary submission of stallions for examination. The agricultural societies throughout the State were requested by circular to organize parades at local centres at which the veterinary officers of the Department would attend for the examination of horses brought forward by owners. Fifty-six societies in different parts of the State responded to the invitation, and seventy-eight parades and shows were attended by the examining officers. A total of 918 horses were submitted for examination, representing about 50 per cent. of the stallions standing for public service in the State. Of these, 215 (23·42 per cent.) were rejected and 703 certificated. That such a large number of horses should have been volun-

[1] Abstract from Third Annual Report (Season 1909) on the Veterinary Examination of Stallions for the Government Certificate of Soundness and Approval. The full report, with complete list of names of the stallions, district, and other particulars, are to be found in the April number of the *Journal of Agriculture of Victoria*.

tarily submitted in the face of the rejections that were continually being experienced by owners was in a great measure due to the pressure upon stallion owners of horse-breeders. The owners of mares apparently realized that the scheme was for their ultimate benefit; and, very shortly after the outset, the bulk of them apparently decided to patronize certificated stallions only.

In the following table is set out the number of horses examined in 1907, the numbers of each breed, the number and percentage of horses rejected and certificated, and the number of horses affected with the particular unsoundnesses dealt with :—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, 1907.

	DRAUGHTS		LIGHTS		PONIES		TOTALS	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
Defects	403	271	301	246	214	186	918	703
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected
	132	32·75	55	18·27	28	13·08	215	23·42
Unsoundness								
Sidebones ...	82	20·35	3	·99	—	—	85	9·35
Ringbones ...	9	2·23	4	1·32	2	·93	15	1·63
Spavin (bone)	3	·74	15	4·95	1	·46	19	2·06
Bog spavin and thoroughpin	2	·49	4	1·32	—	—	6	·65
Curb	—	—	6	1·99	6	2·80	12	1·30
Cataract (eye)	—	—	—	—	1	·46	1	·10
Totals unsoundness	96	23·82	32	10·63	10	4·67	138	15·04
Below standard for approval	36	8·93	23	7·64	18	8·41	77	8·38
Grand totals ...	132	32·75	55	18·27	28	13·08	215	23·42

In 1908, certain modifications of the scheme, dictated by experience gained during the first season, were adopted. As stated, the scheme was on a purely voluntary basis in 1907. There was no obligation on the part of an owner to submit his horse, and the regulations did not provide any disability in respect of horses not submitted, nor, indeed, of horses rejected. The possession of the Government Certificate was no protection at shows against competition from uncertificated horses. A number of cases occurred in which a rejected horse was placed first by the judges over certificated animals. To overcome this anomalous state of things, it was made a condition of the Government grant to agricultural societies that a Government Certificate should be held by all stallions three years old or over

competing. The imposition of this condition made the scheme compulsory in respect of all horses it was desired to show, inasmuch as practically the whole of the agricultural societies throughout the State were receiving a Government subsidy. Along with the introduction of the compulsory condition to the extent mentioned, it was provided that any owner who felt aggrieved at the rejection of his horse should be given an opportunity of appealing against the decision of the examining officer. Since the regulations providing for an appeal were adopted 486 horses have been rejected, and in no instance has the opportunity to appeal been taken advantage of.

In 1908, 118 inspection parades were attended by the Departmental officers, at which 995 horses were submitted for examination. Of these, 742 were certificated and 253 (25·41 per cent.) were rejected. The following table sets out detailed particulars as regards the 1908 season :—

ANALYSIS OF DEFECTS OF HORSES REFUSED CERTIFICATES, 1908.

	DRAUGHTS		LIGHTS		PONIES		TOTALS	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
Defects	501	341	295	242	199	159	995	742
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent Rejected
	160	31·92	53	17·96	40	20·10	253	25·41
Unsoundness								
Sidebones ...	99	19·76	1	·33	—	—	100	10·05
Ringbones ...	20	3·99	7	2·37	3	1·50	30	3·01
Spavin (bone)	3	·59	8	2·71	—	—	11	1·10
Bog spavin and thoroughpin	15	2·99	3	1·01	—	—	18	1·80
Curb	—	—	8	2·71	2	1·00	10	1·01
Roarer ...	—	—	2	·67	—	—	2	·20
Totals unsoundness	137	27·33	29	9·83	5	2·50	171	17·17
Below standard for approval	23	4·59	24	8·13	35	17·58	82	8·24
Grand totals ...	160	31·92	53	17·96	40	20·10	253	25·41

Although, strictly speaking, the 1909-10 season has not been altogether completed, the bulk of the work has been got through, and it has been deemed advisable in this report to submit the figures up to December 31, 1909.

The number of horses examined this season totalled 751, of which 528 were certificated and 223 (29·69 per cent.) rejected. The increase

in the percentage of rejections has been due to a somewhat higher standard being adopted as regards breed, type, and conformation. The rejections under this heading account for 14·65 per cent. this year, as against 8·38 per cent. and 8·24 per cent. in 1907 and 1908 respectively.

The following table applies to the season 1909, and gives particulars identical with those furnished in the previous tables as regards the two previous years :—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, 1909.
(UP TO DECEMBER 31, 1909.)

	Draughts		Lights		Ponies		Totals	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
Defects	408	273	191	147	152	108	751	528
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected
	135	33·08	44	23·04	44	28·94	223	29·69
Unsoundness								
Sidebones ...	84	20·59	—	—	—	—	84	11·18
Ringbones ...	11	2·69	3	1·57	1	·66	15	1·99
Spavin (bone)	1	·24	2	1·04	1	·66	4	·54
Bog spavin and thoroughpin	—	—	1	·52	—	—	1	·13
Curb	—	—	6	3·14	3	1·97	9	1·20
Totals unsoundness	96	23·52	12	6·27	5	3·29	113	15·04
Below standard for approval	39	9·56	32	16·77	39	25·65	110	14·65
Grand totals ...	135	33·08	44	23·04	44	28·94	223	29·69
New Zealand Examinations (certificated but not included in above figures)	32	—	1	—	—	—	33	—

AGGREGATE RESULTS TO DATE—1907-08-09.

Up to December 31, 1909, 2,664 stallions had been examined, 1,973 having been certificated (74.07 per cent.) and 691 rejected (25·93 per cent.). Of these, 442 (15·83 per cent.) were rejected on the ground of hereditary unsoundness, and 269 (10·10 per cent.) were disapproved as being below a reasonable standard for Government certification. As regards unsoundnesses, detailed particulars concerning the grounds for rejection are given in the following table :—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES FOR SEASONS 1907, 1908, 1909 (UP TO DECEMBER 31, 1909).

	Draughts		Lights		Ponies		Totals	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
Defects	1,312	885	787	635	565	453	2,664	1,973
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected
	427	32·54	152	19·31	112	19·82	691	25·93
Unsoundness								
Sidebones ...	265	20·20	4	·51	—	—	269	10·10
Ringbones ...	40	3·05	14	1·77	6	1·06	60	2·24
Spavin (bone)	7	·53	25	3·18	2	·36	34	1·27
Bog spavin and thoroughpin	17	1·29	8	1·02	—	—	25	·94
Curb	—	—	20	2·54	11	1·94	31	1·16
Cataract (eye)	—	—	—	—	1	·18	1	·04
Roarer ...	—	—	2	·25	—	—	2	·08
Totals unsoundness	329	25·07	73	9·27	20	3·54	422	15·83
Below standard for approval	98	7·47	79	10·04	92	16·28	269	10·10
Grand totals ...	427	32·54	152	19·31	112	19·82	691	25·93

REJECTIONS FOR UNSOUNDNESS.

Of all horses examined, 15·83 have been refused certificates on the ground of hereditary unsoundness solely. This percentage is comparatively small when compared with the results that have been published as regards hereditary unsoundness in some other countries. But any ground for congratulation in this respect is removed when it is realized that in respect of draught horses no less than 25·07 per cent., or practically one-fourth of all horses submitted, have been rejected as being affected with one or other of the hereditary unsoundnesses. The position as regards draught horses cannot thus be considered as other than serious; but hope, as regards a quick improvement from the continuance of the present system of examination, may be gathered from the results that have followed on the similar action which was taken twenty-five years ago by the Royal Shire Horse Society of Great Britain as regards unsoundness. At that time about 30 per cent. of the horses shown had to be rejected for unsoundness. The weeding out process has been going on ever since, with the result that certain families which were then predominant have been practically obliterated, and the families now responsible for the show stock of horses do not contain more than 5 per cent. of horses still carrying the taint of hereditary unsoundness.

Complete records have been kept of the unsoundnesses for which individual horses were rejected, and of the family pedigrees and histories of such horses. It was realized shortly after the commencement of the scheme that the collection of such information would prove extremely interesting as time went on, as tending to prove or disprove, as the case may be, the hereditary character of the unsoundnesses in respect of which rejections have been made. In point of fact, a study of these records has proved of greater interest and more importance than was at first anticipated. By them I have been able to set forth information of a character such as has not been published in detail before. In a contribution to a thesis which I presented to the Melbourne University I was able to furnish particulars of a most interesting character concerning the incidence of unsoundnesses as regards breed and the age period of development of the various hereditary unsoundnesses, as also tables and family histories showing completed evidence of the hereditary character of sidebone, ringbone, curb, and bog spavin. As this University paper will be published as an addendum to this report, there is no necessity to here repeat the details and conclusions set forth in it.

As compared with the draught horses, it is satisfactory to find that only 9 per cent. of light horses have been rejected, and in the case of ponies the rejections for unsoundness have been particularly low —namely, 3·5 per cent.

Rejections as regards Standard.

On the other hand, more ponies (16·28 per cent.) and light horses (10 per cent.) have been rejected as being below a reasonable standard for Government approval than in the case of draught horses, of which only 7·4 per cent. have been rejected for this season.

On this aspect of the working of the scheme, it is opportune to again draw attention to the necessity (which, in my opinion, is urgent if the quality of the horse stock of the State is to be improved) of strengthening this side of the scheme. I have previously pointed out that the veterinary officers engaged in the work of examination have had no desire to undertake the function of judging as regards breed, type, and conformation, and it may be said that they have only exercised this function in respect of stallions presented to them, which it would have been for them a matter of shame to have signed a certificate in favour of. With a staff of competent judges to deal with this aspect of the matter as firmly as the veterinary officers have dealt with the unsoundness aspect, much-needed weeding out of inferior sires would be brought about in the course of two or three years. It is idle to say that in respect of type, breed, and conformation, matters should be left in the hands of breeders themselves to determine. It is to such a drifting policy that, in a large measure, may be attributed the deterioration as regards quality that is being complained of on all hands. If quality of progeny is to be maintained, the standard of sires must be kept up. Even with the use of the best sires, there is always a sufficiency, if not a redundancy of misfits. Mediocre horses, as regards quality, type, and power may be, and are, bred in sufficiently large numbers, even when the best sires are used on mediocre mares; and to add to the trouble by using also a mediocre sire will inevitably result in a still further

deterioration. The present position of affairs indicates plainly that the matter cannot be safely left in the hands of breeders. It is too true that many breeders are too prone to patronize inferior stallions, because of their cheapness; and to save them from themselves, it has become necessary that an efficient method of Government control should be fearlessly carried out.

Extension of the Scheme to other States.

The system adopted three years ago in Victoria has been put into force in the three neighbouring States of New South Wales, Queensland, and South Australia. Each of these States commenced to carry out examinations under regulations practically identical with those which have been operative in Victoria. So far, however, the system in the sister States has been confined to examination of stallions at shows. Consequently, the numbers that have been examined in the States named have been comparatively small. Figures are not to hand from South Australia, but tables of results have been published as regards examinations made to date in Queensland and New South Wales. For purposes of comparison, I append a table setting out the numbers of stallions examined and rejected in Victoria, Queensland, and New South Wales respectively during the season 1909. They are as follows:—

Class	Number Examined			Number Rejected			Percentage Rejected		
	Victoria	Q'land	N. S. W.	Victoria	Q'land	N. S. W.	Victoria	Q'land	N. S. W.
Draughts...	408	55	13	135	27	7	33·08	49·09	53·84
Lights ...	191	78	14	44	13	2	23·04	16·64	14·28
Ponies ...	152	32	9	44	3	1	28·94	9·37	11·11
Totals ...	751	165	36	223	43	10	29·69	26·06	27·77

Reciprocal Arrangements with other Countries.

Prior to the commencement of the 1909 season, it was arranged, in order to meet the convenience of importers of horses from New Zealand, that the Victorian Government would issue the Government Certificate of Soundness without examination in respect of horses imported from New Zealand which had been there examined by a Government veterinary officer and certified under the conditions laid down in the Victorian Regulations. Altogether, under this departure, thirty-three New Zealand certificates were accepted and exchanged for the Victorian Government Certificate. Doubtless, prior to the commencement of the forthcoming season, similar arrangements will be entered into with the Governments of New South Wales, Queensland, and South Australia, whereby a horse certificated in one State will be accepted by the Government of every other State as qualified for certification in such State. Before this can be arranged, however, it will be necessary that the States concerned shall be satisfied as to the uniformity of standard of examination and as regards the unsoundnesses constituting a bar.

English Examinations.

In order to insure that only sound horses are imported from Great Britain in the future, and to avoid disappointment and loss on the part of importers, it was decided before the commencement of last season that certificates issued by certain societies in England, Scotland, and Ireland would be accepted here as a basis for the issue of the Victorian Government Certificate of Soundness, without further examination at this end. The societies asked to co-operate in this matter were the Royal Shire Horse Society (England), Royal Agricultural Society (England), Royal Dublin Society's Horse Show (Ireland), Highland and Agricultural Society (Scotland), and the Glasgow and West of Scotland Agricultural Society. To this end the societies named were written to some time ago and asked to authorize and undertake the duty. So far, replies have been received from the Royal Dublin Society, the Highland and Agricultural Society, and the Shire Horse Society. The two former letters intimate that those societies are to take the matter into consideration shortly, and the Shire Horse Society, in its letter, states that its Council has decided to accede to the request of this Government, and has authorized for the purpose examination by their Senior Veterinary Inspector (Professor Penberthy). Certificates will be accepted from Professor Penberthy, not only in respect of shire horses, but in respect of horses of any breed, as also certificates from the veterinary inspectors of the other societies named, provided such certificates are issued officially on behalf of the societies.

Regulations and List.

Regulations governing the examination of stallions, together with list of certificated stallions, have been published each year at the close of the season, and may be had on application to the Secretary.

During the season 1907, fifty-six parades and shows were attended; during 1908, the examinations were conducted almost wholly at parades, of which 118 were arranged for and attended. During the last season (1909), 124 parades have been carried out.

Examining Officers.

So far as possible, the desire has been in this State to make the examinations uniform. To that end, not more than four officers have been engaged each season on examinations. After the first year, however, Mr. Norman McDonald, G.M.V.C., retired from the service of the Department to visit England. During the second season I ceased conducting examinations personally, in order that my position on the Court of Appeal might not be prejudiced. Messrs. W. J. Colebatch, M.R.C.V.S., and W. A. N. Robertson, G.M.V.C., have been examining officers throughout, and for the past two seasons Mr. J. Lyons, M.R.C.V.S., and Mr. E. A. Kendall, G.M.V.C., completed the staff. It is to be regretted that, in future, the scheme will not have the valued assistance of Mr. W. J. Colebatch or Mr. J. Lyons, both of whom have retired from the Government service in this State to undertake more lucrative positions in South Australia and New Zealand respectively. The examining staff has, however, been increased by the addition of Mr. R. Griffin, M.R.C.V.S., and Mr. W. J. Cother, G.M.V.C. It is not too much to say that the success that has attended

the carrying out of the scheme so far has been in a great measure due to the high qualifications possessed for this class of work by the officers concerned, whereby the fullest confidence of both the Government and the horse-breeding public has been established.

Review.

A Handbook of Practical Parasitology. By Dr. Max Braun and Dr. M. Lühe, Königsberg. Translated by L. Forster. Pages 208 + viii., and 100 illustrations. Published by Messrs. Bale, Sons, and Danielsson, Limited, London. Price 10s. 6d. net.

This excellent little book is one that should be in the hands of all students of parasitology. It deals solely with animal parasites, and is written in three parts, dealing respectively with parasitic Protozoa, Helminths, and Arthropoda. In each section the authors give the most useful information as to the technique for obtaining and examining material. It is obvious that proper methods are essential to reliable examinations, and we confidently assert that no student of parasitology can fail to make excellent preparations for examination, &c., if he follows the lines laid down by the authors. We confidently recommend this book—which is excellently produced—to all workers in parasitology.

Personal.

Mr. G. L. Y. Ingram, M.R.C.V.S., has been appointed Veterinary Assistant at the Brown Institution.

Mr. T. W. W. Wright, M.R.C.V.S., has been appointed Tutor, and Mr. D. A. E. Cabot, M.R.C.V.S., Assistant Hospital Surgeon, in the Royal Veterinary College, London.

Mr. Percy Simpson, F.R.C.V.S., of Maidenhead, the popular President of the Royal Counties Veterinary Medical Association, has been appointed Veterinary Referee at the forthcoming Dublin Horse Show.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Examinations in London.

At a meeting of the Board of Examiners held in London on July 8 for the written, and on and between July 12 and 15 inclusive for the oral and practical examinations, the following gentlemen passed their final examination :—

Mr. D. A. E. Cabot
" D. H. Dimes
" G. Fox.
" H. C. D. Golledge
" B. Gorton
" W. D. Jordan
" E. C. Lloyd
" R. E. Lloyd
" L. H. Leach
" S. Little
Mr. B. A. Myhill
" D. Meadows *
" A. H. McDougall
" C. J. S. Macara-Finnie
" G. T. S. Mower
" G. V. Slinn
" O. Stinson
" A. B. Fewings
" R. C. G. Thwaytes
" T. W. W. Wright

The following passed their third examination :—

Mr. R. B. Cockburn
" O. Dixon
" T. J. Davis
" J. T. Edwards †
" G. V. Golding
" H. E. Hornby *
Mr. F. F. Horton
" C. Holland *
" F. C. Minett *
" W. A. Pool *
" G. F. Steevenson †
" H. Stephenson

The following passed their second examination :—

Mr. V. Boyle *
" O. S. Broadhurst
" K. J. S. Dowland
" J. Facer
" E. S. Farbrother
" J. Going
" S. J. Gilbert *
" W. P. Hamlyn
" A. C. Holl *
Mr. P. Howard
" S. W. Marriott
" W. F. Morton *
" K. H. Soutar
" J. M. Smith
" G. M. Vincent
" P. R. Viljoen †
" U. W. F. Walker
" E. J. B. Sewell

The following passed their first examination :—

Mr. W. A. Austin*
" D. Blyth
" C. Davenport*
" H. W. Dawes†
" G. van de W. De Kock
" W. P. S. Edwards
" G. R. Grey *
" A. Hoskin *
" R. C. G. Hancock
" W. B. Howe *
" V. J. Hare
" G. C. Harding
Mr. H Hicks*
" H. A. King
" R. H. C. Lucas
" G. F. Marais *
" W. H. Priston
" J. M. L. Penhale *
" W. B. Pershouse
" R. H. Stalker
" J. Southall
" W. L. Sheffield*
" A. R. Smythe *
" H. S. Wright

Marked thus † passed with First Class Honours.
Marked thus * passed with Second Class Honours.

Examinations in Liverpool.

At a meeting of the Board of Examiners held in Liverpool on July 8, for the written, and on and between July 14 and 16 inclusive for the oral and practical examinations, the following gentlemen passed their final examination :—

Mr. J. R. Barker	Mr. C. W. Makinson
,, W. A. Dykins	,, H. Quiggin
,, R. Hopps	,, W. K. O. Williams

The following passed their third examination :—

Mr. A. W. Allen	Mr. K. S. Jones
,, T. Craig	,, W. P. Stokes *
,, G. G. Howard	

The following passed their second examination :—

Mr. V. A. Bartrum	Mr. C. W. Loy
,, R. Isherwood	,, J. W. Proctor
,, R. H. Knowles *	,, H. Sumner

The following passed their first examination :—

Mr. J. Blackburn *	Mr. J. A. Ward †
,, C. W. Elam †	

Marked thus † passed with First Class Honours.

Marked thus * passed with Second Class Honours.

Examinations in Dublin.

At a meeting of the Board of Examiners held in Liverpool on July 8 for the written, and on and between July 14 and 19 inclusive for the oral and practical examinations, the following gentlemen passed their final examination :—

Mr. F. B. Hayes	Mr. R. O'Donnell
,, R. H. C. Higgins	,, J. F. O'Grady
,, T. R. Hunt	,, E. L. Porter
,, A. C. Kirkpatrick	,, F. J. Sheedy
,, P. McDonnell	,, F. T. Smyth
,, Wm. Nyhan	

The following passed their third examination :—

Mr. H. W. Carbury	Mr. A. S. Mathias
,, Peter Francis Dolan	,, T. F. O'Brien *
,, Desmond English *	,, Cecil Roche
,, Thos. Gordon	,, Thos. L. Shea
,, Esmond W. Little	,, Nasli Dinshaw Vakel

The following passed their second examination :—

Mr. John Jos. Cosgrove	Mr. Thomas O'Leary
,, H. E. A. L. Irwin	,, Jerome J. O'Neill
,, Thos. McD. Kelly *	,, John Quinlan †
,, Michael McClancy	,, Fredk. B. Sneyd
,, Daniel J. O'Byrne	

The following passed their first examination :—

Mr. Thomas G. Browne	Mr. Jos. Jas. Mills
,, T. D. Condell	,, John P. McNally *
,, J. R. Ellison	,, John Jerome Pomeroy
,, David E. Greene *	,, A. P. Preston
,, Mark P. Hatch	,, Thomas Reddin
,, J. J. Hegarty	,, C. M. Stewart *
,, St. J. C. P. McFarlan	,, Michael Toomey

Marked thus † passed with First Class Honours.

Marked thus * passed with Second Class Honours.

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; Bulletin of the Bureau of Sleeping Sickness; Annual Report of the Proceedings under the Diseases of Animals Acts, for 1909; Journal of the Quekett Microscopical Society; Journal of the Royal Army Medical Corps.

Letters and Communications, &c.

Mr. Lewis; Mr. A. N. Pillers; Mr. C. H. Huish; Mr. F. Bullock; Mr. A. Wilson; Mr. Burton Rogers; Board of Agriculture and Fisheries; Department of Agriculture and Technical Education for Ireland, &c.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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